Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27 onwards

Course Information

Programme	B. Tech. (Electronics Engineering)
Class, Semester	First Year B. Tech., Sem.-I
Course Code	8BS113
Course Name	Linear Algebra and Calculus (EN)
Desired Requisites:	Mathematics course at Higher Secondary Level

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

Credits: 3

Course Objectives

1	To introduce the fundamental concepts of linear algebra and differential calculus.
2	To develop problem-solving skills using integral calculus and multiple integrals.
3	To study vector differentiation and vector integration in engineering applications.
4	To apply mathematical techniques for modelling and solving engineering problems.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statements**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Descriptor**
CO1	**Understand** the concepts of matrices, eigenvalues, eigenvectors and differential calculus.	II	Understanding
CO2	**Understand** the principles of improper integral and multiple integrals.	II	Understanding
CO3	**Apply** matrix methods and vector differential calculus techniques to solve engineering problems.	III	Applying
CO4	**Apply** multiple integration and vector integral techniques to solve the engineering problems.	III	Applying

Module	**Module Contents**	**Hours**
I	**Linear Algebra** Matrices and Rank, system of Linear equations, Gauss elimination method, Eigen value and Eigen vector, Cayley Hamilton Theorem.	5
II	**Differential Calculus** Partial derivative, error and approximations, maxima and minima, Mean value theorems.	4
III	**Vector Differentiation** Velocity and acceleration, directional derivative, gradient, divergence, Curl of vector function.	4
IV	**Integral Calculus** Introduction, Improper integral, Gamma function and its properties, Beta function and its properties.	5

V	**Multiple Integral** Double Integration, Triple Integration, change order of Double Integration, Change Cartesian to Polar coordinates.	5
VI	**Vector Integration** Work done, Line integral, surface integral, Green's theorem, Stoke's theorem.	5

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

References	
1	Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, Inc., 10th Edition, 2015.
2	R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing House, 5th Edition, 2016.
3	George B. Thomas, Maurice D. Weir, and Joel Hass, Thomas' Calculus, Pearson Education, 14th Edition, 2018.
4	Glyn James, Advanced Modern Engineering Mathematics, Pearson Education, 5th Edition, 2018.

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc20_ma37/preview
2	https://onlinecourses.nptel.ac.in/noc22_ma75/preview

CO-PO Mapping

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

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

Assessment

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

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Course Information

Programme	B. Tech. (Electronics Engineering)
Class, Semester	First Year B. Tech., Sem.-I
Course Code	8BS114
Course Name	Material Science
Desired Requisites:	Students are expected to know the basic concept in Chemistry.

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

Desired Knowledge

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

Course Objectives

1	To develop an understanding of engineering materials and their applications in engineering practice.
2	To provide knowledge of material characterization and chemical analysis for engineering applications.
3	To impart understanding of PCB materials, chemical etching, corrosion mechanisms, and protection techniques.
4	To familiarize students with phase equilibria, renewable energy materials, and emerging technologies for sustainable engineering solutions.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Understand principles of chemical analysis and instrumental techniques for the characterization of materials.	II	Understand
CO2	Understand concepts related to corrosion science, renewable energy materials, and phase equilibria.	II	Understand
CO3	Apply knowledge of engineering materials and energy systems**,** including conducting, semiconducting, dielectric, and magnetic.	III	Apply
CO4	Demonstrate chemical analysis experiments, interpret experimental data, and prepare technical laboratory reports. (Lab).	III	Apply

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

II	**Energy Storage Systems and Materials:** Fundamentals of electrochemical energy storage, Battery technologies (Li-ion, Lead-acid, Solid-state – basics), Supercapacitors, Fuel cells – working principle, Materials challenges in energy storage.	3
III	**Printed Circuit Boards (PCBs) and Chemical Etching Process**: Introduction to PCBs and Materials Chemistry: Introduction to PCB, Basic Structure of PCB, Chemistry of Substrate material, Copper Properties. What is Etching? Etching Chemicals, Chemical Reactions (Ferric Chloride Etching), Oxidation–Reduction Concept, Factors Affecting Etching Rate. PCB Fabrication Methods: Methods of Pattern Transfer, Surface Preparation, Environmental and Safety Aspects, Defects in Etching.	4
IV	**Corrosion Science:** Fundamentals of corrosion, Electrochemical corrosion mechanisms, Factors affecting corrosion, Types of corrosion (uniform, pitting, crevice, galvanic), Corrosion monitoring & control, Corrosion prevention methods (coatings, cathodic protection).	5
V	**Phase Rule**: Gibbs phase rule, Explanation of the terms Phase, Component, Degree of freedom, Phase reactions, types of equilibrium, equilibrium conditions. One component system-Water system, Sulphur system, Application of Eutectic system, Merit and Demerits of Phase rule.	3
VI	**Renewable Energy Materials and Systems:** Solar photovoltaic materials (Si, Thin film – basics), Wind energy materials (composites in blades), Materials for hydrogen production, Power electronics material requirements.	3

List of Experiments/ Lab Activities (Any 10)	
1	Estimation of hardness of water by EDTA method (Complexometric titration).
2	Estimation of alkalinity of water (Neutralization titration).
3	Estimation of dissolved oxygen in water (Iodometric titration).
4	Estimation of chloride content in water (Argentometry).
5	Demonstration of pH meter and pH metric titration.
6	Determination of strength of acid/base conductometrically.
7	Colorimetric estimation of copper.
8	Estimation of copper from bronze (Iodometric titration).
9	Estimation of Zn from brass (Displacement titration).
10	Determination of purity of iron (Redox titration).
11	Determination of viscosity using Ostwald viscometer.
12	Determination of corrosion rate by weight loss method.
13	Gravimetric estimation of Ba from $BaSO_4$ as BaO.
14	Preparation of resin.
15	To prepare a single-layer PCB using the chemical etching method and understand the redox reaction involved.

Textbooks	
1	A. I. Vogel, *A Textbook of Quantitative Chemical Analysis*, 5th ed. London, U.K.: Longman Scientific & Technical, 1989.
2	B. K. Sharma, *Engineering Chemistry*. Meerut, India: Krishna Prakashan Media Pvt. Ltd., 2014.
3	C. Baird and M. Cann, *Environmental Chemistry*, 5th ed. New York, NY, USA: W. H. Freeman and Company, 2012.

4	J. R. Mihelcic and J. B. Zimmerman, *Environmental Engineering: Fundamentals, Sustainability, Design*, 2nd ed. Hoboken, NJ, USA: John Wiley & Sons, 2014.
5	S. Rani, *Laboratory Manual on Engineering Chemistry*. New Delhi, India: Dhanpat Rai Publishing Co., 2018.

References

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

Useful Links

1	https://www.youtube.com/watch?v=Vl3BYsoif-c&pp=ygU3bnB0ZWwgZW5naW5lZXJpbmcgY2hlbWlzdHJ5IHNwZWN0cm9zY29weSB1diB2aXMgaXIgbWFzcw%3D%3D
2	https://www.youtube.com/@nptelhrd/search?query=vulcanization+rubber+nptel
3	https://nptel.ac.in/?utm_source
4	https://onlinecourses.nptel.ac.in/noc25_ee163/preview?utm_source
5	https://nptel.ac.in/courses/121101030?utm_source

CO-PO Mapping (Theory)

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

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

Assessment (Theory)

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

Assessment (Lab)

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

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

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

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Course Information

Programme	B. Tech. (Electronics Engineering)
Class, Semester	First Year B. Tech., Sem.-I
Course Code	8ES151
Course Name	Engineering Exploration
Desired Requisites:	-

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

Course Objectives

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

Course Outcomes (CO)

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

CO – PO mapping

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

Module	Module Contents	Hours
I	**Module 1: Introduction to Engineering and Engineering Study** Requirements and expectations of Engineering, disciplines of engineering, Expectation of modern engineer and Graduate Attributes Significance of teamwork, Significance of Agile practices, Significance of documentation	03 + 04

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

Course Project

Physical Implementation: Prototyping planning/Prototyping Sprint Reviews 18 Hrs

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

Sample need statements

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

Expected Deliverables

1) Problem Statement
2) Objectives
3) Literature Review
4) Methodology
5) Sustainability Analysis
6) Ethical Considerations
7) Prototype/Model/Survey/Simulation

8) Results and Discussion
9) Conclusion and Future Scope
10) Presentation and Final Report

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

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

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

Text Books

1	Introduction to Engineering, Paul H. Wright, Carl T. F. Ross, Wiley India, 2008
2	Engineering Design: A Project-Based Introduction. 4th ed., by Clive L. Dym and Patrick Little, John Wiley & Sons, 2013.

References

1	Systems Engineering Principles and Practice, Alexander Kossiakoff, William N. Sweet, Samuel J. Seymour, Steven M. Biemer, Wiley, 2020

2	Engineering Ethics: Concepts and Cases, Charles E. Harris Jr., Michael S. Pritchard, Michael J. Rabins, Cengage Learning, 2018
3	Norman, D. A., The Design of Everyday Things, Revised and Expanded Edition, Basic Books, 2013.
4	Ulrich, K. T., & Eppinger, S. D., Product Design and Development, 7th Edition, McGraw-Hill, 2024.
5	Ashby, M. F., Materials Selection in Mechanical Design, 5th Edition, Elsevier, 2016.
6	Budynas, R. G., & Nisbett, J. K., Shigley's Mechanical Engineering Design, 11th Edition, McGraw-Hill, 2019.
7	White, E., Making Embedded Systems, 2nd Edition, O'Reilly Media, 2024.
Useful Links	
1	https://youtube.com/playlist?list=PL2935W76vRNEE_NNWlpUar20iUdkFQ1z2&si=-MaDgeRnw2uTllTw
2	https://onlinecourses.nptel.ac.in/e-learning/preview/noc22_mg54
3	https://onlinecourses.nptel.ac.in/e-learning/preview/noc25_mg63
4	https://www.youtube.com/playlist?list=PLGxa5y5etMwAY238yKu1orXTnzD9h5nL_
5	https://docs.arduino.cc/

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Course Information

Programme	B. Tech. (Electronics Engineering)
Class, Semester	First Year B. Tech., Sem.-I
Course Code	8ES111
Course Name	Engineering Graphics
Desired Requisites:	Basic Knowledge of Different Types of Curves, Line and Planes.

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

Course Objectives

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

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Draw and interpret engineering graphics using standard BIS conventions and drafting practices.	I	Demonstrating
CO2	Explain principles of projections, sections, and graphical representation of engineering objects.	II	Understanding
CO3	Apply engineering graphics principles to prepare electrical diagrams, layouts, and installation drawings.	III	Applying
CO4	Create CAD-based electrical engineering drawings, panel layouts, and wiring schematics following industry standards.	IV	Analysing

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

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

Module wise Measurable Students Learning Outcomes :

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

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

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

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

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

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

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

Text Books	
1	Bhatt N.D., Panchal V.M. and Ingle P.R., Engineering Drawing, Charotar Publishing House, 2014.
2	Surjit Singh, *Electrical Engineering Drawing*, Dhanpat Rai Publications, New Delhi.
3	K. V. Natarajan, *A Textbook of Electrical Engineering Drawing*, Dhanpat Rai & Co.
References	
1	Narayana, K.L. and P Kannaiah, Text book on Engineering Drawing, Scitech Publishers, 2008.
2	Fredderock E. Giesecke, Alva Mitchell and Others, *Principles of Engineering Graphics*, Maxwell McMillan Publishing, 2010.
3	Uppal S. L. and Rao S., *Electrical Wiring, Estimating and Costing*, Khanna Publishers.
Useful Links	
1	https://nptel.ac.in/courses/112/103/112103019/
2	https://nptel.ac.in/courses/105/104/105104148/
3	https://www.youtube.com/watch?v=xXdpkQXDuMw&list=PL9RcWoqXmzaJT-fliqTSwUjWU4zCX_H2A

CO-PO Mapping For Electrical Engineering Department

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

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

CO-PO Mapping For Electronics Engineering Department

	Programme Outcomes (PO)												PSO		
	1	2	3	4	5	6	7	8	9	10	11		1	2	
CO1	3				2					1			2		
CO2			2										1		
CO3					3					1			2		
CO4											3		1		
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															

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

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Course Information	
Programme	B. Tech. (Electronics Engineering)
Class, Semester	First Year B. Tech., Sem.-I
Course Code	8EN101
Course Name	Digital Electronics
Desired Requisites:	Engineering Physics

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

Course Objectives	
1	To **illustrate** the number systems with examples.
2	To **explain** the logic gates and their use in combinational and sequential circuits.
3	To **explain** the difference between the combinational and sequential circuits.

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	**Solve** problems on number systems, binary arithmetic, coding schemes, and perform arithmetic operations in different number systems.	Apply
CO2	**Simplify** Boolean expressions and implement combinational logic circuits.	Apply
CO3	**Design** and **analyze** combinational and sequential circuits.	Create
CO4	**Analyze** the finite state machines and basic ADC/DAC techniques for digital system applications.	Analyze

Module	**Module Contents**	**Hours**
I	**Module 1: Introduction to Number Systems** Introduction to number system. Binary, Hex BCD, Gray code, Arithmetic operations, Addition, Subtraction on binary, Hex, BCD numbers.	4
II	**Module 2: Logic Gates** Review of logic gates, NAND/NOR as universal gates, tri-state logic, algebraic minimization (min-terms, max- terms), K-map minimization, Realization using gates, converting AOI to NAND/NOR.	6
III	**Module 3: Combinational Circuits** Design of comparator, Adder/subtractor, Code converters, Introduction to Mux/ Demux.	8
IV	**Module 4: Sequential Circuits** Introduction to sequential circuits, Latches and flip-flops: SR, JK, D and T flip-flops, asynchronous counters. Mod N Counters, BCD counters, Shift Register.	8
V	**Module 5: State Diagram** Introduction to finite state machines: Mealy Machine & Moore Machine, State diagram, State assignment, State Reduction. Merger Chart methods.	7
VI	**Module 6: Introduction to ADC and DAC** Introduction to data converters, basic concept and working of ADC and DAC, sampling and quantization, resolution and step size, types of ADC and DAC, applications of ADC and DAC.	6

Textbooks	
1	John F. Wakerly, *"Digital Design",* Pearson Education Publication, 4th edition, 2008.
2	Anand Kumar, "*Fundamentals of Digital Circuits*", PHI, 2nd Edition, 2009.
3	MandalS.K , "*Digital Electronics*" 1st Ediction.Mc-Graw-Hill, 2009.
References	
1	R..P.Jain, "*Modern Digital Design",* Mc-Graw-Hill, 4th edition, 2010.
2	Morris Manno, "Digital Logic and Computer Design", Prentice-Hall India, 4th edition, 2014
Useful Links	
1	https://learn-aboutelectronics.com
2	

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										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
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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Course Information

Programme	B. Tech. (Electronics Engineering)
Class, Semester	First Year B. Tech., Sem. -I
Course Code	8EN151
Course Name	Digital Electronics Lab
Desired Requisites:	12th Physics

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 familiarize students with digital electronic components, ICs, and laboratory instruments.
2	To develop practical skills in implementing and testing combinational and sequential logic circuits.
3	To verify the operation of digital circuits using standard logic ICs and simulation tools.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	**Verify** the operation of logic gates, number system conversions, and Boolean logic using digital hardware and simulation tools.	Apply
CO2	**Design** and **implemen**t combinational logic circuits using standard logic gates.	Analyze
CO3	**Implement** and **analyze** sequential circuits using flip-flops, counters, ADC/DAC.	Analyze

List of Experiments / Lab Activities/Topics

List of Lab Activities:

(A minimum of 10 experiments shall be conducted from the above list during the semester.)

1. Familiarization with Digital Electronics Laboratory, Digital Trainer Kit, Breadboard and Digital ICs
2. Verification of basic logic gates and universal gates (NAND and NOR)
3. Realization of basic gates using universal gates (NAND and NOR)
4. Design and implementation of Half Adder, Full Adder, Half Subtractor, and Full Subtractor
5. Design and implementation of 1-bit magnitude comparator.
6. Design and implementation of Code Converters (Binary to Gray and Gray to Binary)
7. Study and implementation of Multiplexer and Demultiplexer circuits
8. Verification of SR, JK, D, and T Flip-Flops
9. Design and implementation of Asynchronous Mod-N Counter
10. Design and implementation of BCD Counter.
11. Mini Project (Open Lab)

Textbooks

1	John F. Wakerly, *"Digital Design",* Pearson Education Publication, 5th edition, 2018.
2	Anand Kumar, "*Fundamentals of Digital Circuits*", PHI, 2ndEdition, 2009.
3	MandalS.K , "*Digital Electronics*" Mc-Graw-Hill, 1stEdiction., 2009

References

1	R..P.Jain, "*Modern Digital Design",* Mc-Graw-Hill, 4th edition, 2010.
2	Morris Manno, "Digital Logic and Computer Design", Prentice-Hall India, 1st edition 1979.

Useful Links

1	www.learnabout-electronics.com
2	

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

Assessment				
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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Course Information

Programme	B. Tech. (Electronics Engineering)
Class, Semester	First Year B. Tech., Sem-I
Course Code	8VS157
Course Name	Electronics Workshop
Desired Requisites:	-

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

Course Objectives

1	To familiarize students with electronic components, devices, and laboratory instruments used in the assembly, testing, and analysis of electronic circuits.
2	To develop practical skills in circuit construction and measurement techniques using breadboards, power supplies, multimeters, oscilloscopes, and other electronic tools.
3	To impart hands-on experience in soldering, desoldering, wiring, and PCB-related practices following standard safety procedures.
4	To enable students to apply fundamental electronic principles in designing and developing simple electronic systems and mini-projects..

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Identify and characterize electronic components and instruments.	II, III
CO2	Assemble, solder, and test electronic circuits following safety procedures.	III
CO3	Design and simulate simple PCB layouts using EDA tools for electronic circuit implementation.	IV
CO4	Demonstrate teamwork, documentation, and project development skills through workshop activities.	IV

List of Experiments / Lab Activities/Topics

List of Lab Activities:

1. Identification and testing of basic electronic components.
2. Measurement of electrical quantities using Digital Multimeter (DMM) and Oscilloscope.
3. Generation and analysis of various electrical waveforms and signal parameters.
4. Practice of soldering and de-soldering techniques for electronic circuits.
5. Assembly and testing of circuits using breadboard prototyping.
6. Design and simulation of a simple Printed Circuit Board (PCB) using EDA tools.
7. Implementation and testing of basic electronic circuits such as LED control circuits.
8. Experimental verification of fundamental electrical and electronic laws.
9. Design, development, and demonstration of a mini-project based on electronic applications.
10. Preparation of a technical report and presentation of the mini-project.

Textbooks

1	Boylestad & Nashelsky – Electronic Devices and Circuit Theory
2	V. K. Mehta – Principles of Electronics
3	R. S. Khandpur, Printed Circuit Boards: Design, Fabrication, Assembly and Testing
4	Simon Monk, Practical Electronics for Inventors, McGraw-Hill.

References	
1	Clyde F. Coombs Jr., Printed Circuits Handbook, McGraw-Hill.
2	Peter Dalmaris, KiCad Like a Pro Series.
3	Thomas L. Floyd, Electronic Devices, Pearson Education.
Useful Links	
1	https://www.allaboutcircuits.com
2	https://www.electronics-tutorials.ws
3	https://www.pcbway.com/blog/PCB_Basic_Information

CO-PO Mapping

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

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

Assessment

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

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

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

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Course Information						
Programme		B. Tech. (Electronics Engineering)				
Class, Semester		First Year B. Tech., Sem.-I				
Course Code		8AE151				
Course Name		Professional Communication				
Desired Requisites:		10+2 level English				
Teaching Scheme		**Examination Scheme (Marks)**				
Lecture	1 Hrs/week	**LA1**	**LA2**	**ESE**	**Total**	
Interaction	1 Hrs/week	30	30	40	100	
		Credits: 2				

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

Course Outcomes (CO) with Bloom's Taxonomy Level

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	Communicate clearly, confidently, and competently in diverse real-world scenarios	III	Apply
CO2	Demonstrate adequate proficiency in language.	III	Apply
CO3	Demonstrate communication skills (LSRW) in personal and professional settings.	III	Apply
CO4	Work effectively in teams and apply communication and interpersonal skills for career readiness.	III	Apply

Module	Module Contents	Hours
I	**Foundations of Communication** Communication -Nature, Types, and Principles. Barriers to Effective Communication and overcoming them. Developing Effective Listening Skills: Types, listening and note-making.	2
II	**Language Skills & Communicative Grammar** Vocabulary precision, clarity. Modal verbs, passives, phrasal verbs. Common errors & editing Communicative Grammar: modal verbs, question tags, misplaced modifiers, passives Reading comprehension	2
III	**Non-Verbal Communication & Vocalics** Understanding Non-Verbal Communication — Scope and Significance, Codes of non-verbal communication. Vocalics —Understanding Pronunciation, Intonation, and Voice modulation, eliminating fillers Developing Non-verbal skills for professional settings	3

IV	**Formal Oral Communication Skills** Presentation Skills — Structure, Delivery and Confidence. Techniques for public speaking, Group Discussion: Types, Dynamics, and Techniques, Introduction to Debate: Structured Arguments and Rebuttal Techniques.	2
V	**Professional Writing & Business Communication** Introduction to academic writing. Principles of Professional Writing: Brevity, Clarity and Pragmatic writing, Cover letter writing. Résumé Writing: Formats, ATS Compatibility	2
VI	**Interpersonal, Teamwork & Career Communication Skills** Interpersonal skills- Significance, Emotional Intelligence (EQ) —Cores of Emotional Intelligence, Team Building: Definition, Hierarchy and Team Dynamics, Personal Branding in the Digital Age — LinkedIn and Social Media Strategy, Interview Skills: Types, STAR Method, Mock Interview Preparation	3

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

Course Assessment Plan — Notional Learning Hours

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

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

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

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

Notional Learning Hours breakup as per component.

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

CO-PO Mapping

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

Component										Hours		Basis	
CO3							2		2		2			
CO4								3	2		2			
The strength of mapping is to be written as 1,2,3; Where, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO.														

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Course Information

Programme	B. Tech. (Electronics Engineering)
Class, Semester	First Year B. Tech., Sem.-II
Course Code	8BS115
Course Name	Transforms and Complex Analysis
Desired Requisites:	Mathematics course at Higher Secondary Level

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

Credits: 3

Course Objectives

1	To introduce the fundamental concepts of transform techniques, probability, statistics, and complex analysis.
2	To develop the ability to analyse engineering problems using Laplace and Fourier transform methods.
3	To develop an understanding of statistical and probabilistic techniques used in engineering applications.
4	To apply concepts of complex analysis in solving mathematical and engineering problems.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statements**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Descriptor**
CO1	**Explain** the concepts and properties of Laplace transforms, Fourier series, and Fourier transforms.	II	Understanding
CO2	**Explain** the fundamental concepts of probability, statistics, and complex analysis.	II	Understanding
CO3	**Apply** transform techniques to solve engineering and mathematical problems.	III	Applying
CO4	**Apply** statistical, probabilistic, and complex analysis techniques to analyse engineering problems.	III	Applying

Module	**Module Contents**	**Hours**
I	**Laplace Transform** Definition and standard Laplace transform, Properties of Laplace transform, inverse Laplace transform, Applications.	**5**
II	**Fourier Series** Definition and Euler formulae, even and odd functions, Fourier series for arbitrary period, Fourier sine and cosine series.	**4**

III	**Fourier Transform** Fourier integral, Fourier transform, Fourier Sine and Cosine transform, Properties of Fourier transform, Parseval's identities.	**5**
IV	**Statistics** Mean and variance of the data, correlation, Regression, curve fitting.	**5**
V	**Probability** Continuous and discrete random variable, probability mass function, probability density function, Binomial distribution Poisson distribution, Gaussian Distribution, Exponential distribution.	**5**
VI	**Complex Analysis** Analytic function, Cauchy Riemann equation, Taylor's series, Maclaurin's series, Laurent's series, Residue Theorem.	**4**

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

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

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc23_ma43/preview
2	https://onlinecourses.nptel.ac.in/noc21_ma74/preview
3	https://onlinecourses.nptel.ac.in/noc20_ma50/preview

CO-PO Mapping

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

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

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

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Course Information

Programme		B. Tech. (Electronics Engineering)			
Class, Semester		First Year B. Tech., Sem.-II			
Course Code		8BS116			
Course Name		Applied Physics for Electronics Engineering			
Desired Requisites:		Basic concepts of 10+2 level Physics.			
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**MSE**	**ESE**	**Lab**	**Total**
Practical	2 Hrs/week	20	50	30	100
		Credits: 3			

Course Objectives

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

Course Outcomes (CO) with Bloom's Taxonomy Level

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

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

Module	Module Contents	Hours
I	**Modern Physics:** Introduction, Black Body Radiation, Planck's Quantum Theory, Phase Velocity, Group Velocity and Particle Velocity, De-Broglie's Hypothesis, Compton Effect.	5
II	**Quantum Mechanics:** Heisenberg's Uncertainty Principle, Wave Function and Physical Significance, Schrödinger's Time Dependent and Time Independent Wave Equation, Particle in a 1-D Box.	5
III	**Semiconductor Physics:** Introduction, Formation of Energy Bands, Classification of Solid on Basis of Band Theory, Number Levels in a Band, Density of States, Fermi-Dirac Statistics, Fermi Level, Variation of Fermi Level with Temperature, Electrical Conductivity of Metal and Semiconductor, Hall Effect.	5
IV	**Semiconductor Devices:** Formation of P-N Junction, V-I Characteristics of Forward and Reverse Bias of P-N, Rectifier, Clipper & Clamper, Zener Diode, Applications of Diodes.	5

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

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

Textbooks	
1	M. N. Avadhanulu and P. G. Kshirsagar, "A Text book of Engineering Physics", S.Chand Pub.
2	Bhattacharya & Nag, Engineering Physics
3	Harnam Singh, *Advanced Practical Physics for Students*, S. Chand & Company Ltd., Revised Edition, 2011, Volumes I & II.

References	
1	Beiser, Arthur, Concepts of Modern Physics, McGraw-Hill Education, 7th Edition, 2015**.**
2	Streetman, Ben G. and Banerjee, Sanjay Kumar, Solid State Electronic Devices, Pearson Education, 7th Edition, 2015**.**
3	Campbell, S. A. *The Science and Engineering of Microelectronic Fabrication*. 2nd Edition, Oxford University Press, 2001.

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

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

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

Assessment (Theory)

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

Assessment (Lab)

There is one component of lab assessment that is Lab ESE.
IMP: Lab ESE is a separate head of passing (min 40 %).

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

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

Syllabus Prepared By	Dr. A. A. Mohite, Dr. B. N. Jamadar and Dr. K. V. Madhale
Syllabus Checked By	Head, Department of Electronics Engineering

Walchand College of Engineering, Sangli
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Course Information

Programme	B. Tech. Electronics Engineering
Class, Semester	First Year B. Tech., Sem. II
Course Code	8ES112
Course Name	Basic Electrical Engineering
Desired Requisites:	-

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

Course Objectives

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

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	**Describe** basic concepts in Electrical Engineering.	II	Understand
CO2	**Explain** principles, construction and working of electrical machine.	II	Understand
CO3	**Solve** electrical and magnetic circuits.	III	Apply

Module	**Module Contents**	**Hours**
I	**Module 1: DC Circuits** Review of R-L-C Electrical circuit elements, KCL and KVL. Star-delta conversion, voltage and current sources. Thevenin, Norton and Superposition, Maximum power transfer theorems.	5
II	**Module 2: AC Circuits** Representation of sinusoidal waveforms, peak, RMS values, phasor representation real, reactive and apparent power. Analysis of single-phase, ac circuits consisting of R, L, C, RL, RC, RLC (series and parallel) circuits. Voltage and current relations in star and delta.	5
III	**Module 3: DC Machines** Construction, working principle and types of DC generator and Motor. Voltage and speed control methods, Speed-Torque characteristic. Principle, construction, working and application of Permanent Magnet DC Motor, stepper motors, servo motors and universal motors.	4
IV	**Module 4: Transformers** Review of DC & AC Magnetic circuits, Construction, working principle and types of single-phase transformer, open circuit and short circuit test: Losses, efficiency and regulation. Autotransformer.	4

V	**Module 5: AC Machines** Construction and working principle of single and three-phase induction motor. Types, torque-speed characteristics and applications of induction motor, Types of starters, AC generator.	4
VI	**Module 6: Wiring, Electrical Installations and Components of LT Switchgear** Switch fuse unit, MCB, ELCB, MCCB. Types of wire and cables. Staircase, Go-down and Domestic wiring, CFL, LED, Fluorescent tube. Lighting schemes, Earthing, types of batteries, characteristics of batteries.	4

List of Experiments/ Lab Activities (Any 8-10)	
1	Identification and Use of Basic Electrical Measuring Instruments (Voltmeter, Ammeter, Wattmeter, Multimeter and Clamp Meter).
2	Measure and verify the equivalent resistance of series, parallel, and series-parallel resistor networks.
3	Verify Kirchhoff's Current Law (KCL) and Kirchhoff's Voltage Law (KVL).
4	To study series-parallel RL, RC and RLC circuits.
5	To study the construction and working of a DC motor.
6	To study armature and field control methods of DC motor.
7	To study the construction and operation of a single-phase transformer.
8	Perform the open-circuit test on a single-phase transformer.
9	Perform the short-circuit test on a single-phase transformer.
10	To study the construction and operation of a three-phase induction motor.
11	Measure electrical energy consumption using a single-phase energy meter.
12	To study domestic wiring circuits including one-lamp, staircase and godown wiring.
Textbooks	
1	D. P. Kothari and I. J. Nagrath, Basic Electrical Engineering, 4th Edition, McGraw Hill Education, India.
2	B. L. Theraja and A. K. Theraja, A Textbook of Electrical Technology – Vol. I: Basic Electrical Engineering, S. Chand Publishing.
References	
1	Charles K. Alexander and Matthew N. O. Sadiku, Fundamentals of Electric Circuits, 7th Edition, McGraw Hill.
2	William H. Hayt Jr., Jack E. Kemmerly and Steven M. Durbin, Engineering Circuit Analysis, 9th Edition, McGraw Hill.
3	Edward Hughes, Hughes Electrical and Electronic Technology, 12th Edition, Pearson Education.
4	J. David Irwin and R. Mark Nelms, Basic Engineering Circuit Analysis, 12th Edition, Wiley.
Useful Links	
1	Basic Electrical Technology, IISc Bangalore, by Prof. L. Umanand https://nptel.ac.in/courses/108108076
2	Basic Electrical Technology, IIT Kharagpur, by Prof. N. K. De, Prof. G. D. Roy, and Prof. T. K. Bhattacharya https://nptel.ac.in/courses/108105053
3	Fundamentals of Electrical Engineering, IIT Kharagpur, by Prof. Debapriya Das https://nptel.ac.in/courses/108105112

4	Virtual Labs – An Initiative of the Ministry of Education under the National Mission on Education through ICT (NMEICT) https://www.vlab.co.in/broad-area-electrical-engineering https://vlabs.iitkgp.ac.in/asnm/#

CO-PO Mapping													
	Programme Outcomes (PO)											**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	3											1	
CO2	3								2				
CO3		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 (Theory)
The assessment is based on MSE and ESE. MSE shall be typically on modules 1 to 3. ESE shall be on all modules with around 30% weightage on modules 1 to 3 and 70% weightage on modules 4 to 6. For passing a theory course, Min. 40% marks in (MSE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

Assessment (Lab)				
There is one component of lab assessment that is Lab ESE. IMP: Lab ESE is a separate head of passing (min 40 %).				
Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
Lab ESE	Lab Activities/ Journal/ Performance/ Presentations/ Oral/ Mini Project	Lab Course Faculty and External Examiner as applicable	During Week 1 to Week 13. Marks Submission at the end of Week 13.	30
Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.				

Walchand College of Engineering, Sangli

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Course Information

Programme	B. Tech. (Electronics Engineering)
Class | Semester	First Year B. Tech., Sem.-II
Course Code	8ES154
Course Name	Computer Programming
Desired Requisites:	Basic computer knowledge

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	1 Hrs/week	**LA1**	**LA2**	**Lab ESE**	**Total**
Practical	4 Hrs/ Week	30	30	40	100
Interaction	-	**Credits: 3**			

Course Objectives

1	To understand problem solving and problem solving aspects.
2	To learn basics, features and future of C programming.
3	To acquaint with data types, input output statements, decision making, looping, functions, array, string, pointer, structure and union in C.

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 fundamental problem-solving techniques and develop algorithms, flowcharts, and programs using C programming constructs.	II	Understand
CO2	Apply decision-making, iterative statements, functions, arrays, strings, pointers, structures, and file handling concepts to develop efficient C programs.	III	Apply
CO3	Analyze and solve computational problems using Python programming fundamentals, data structures, functions, modules, exception handling, and file operations.	IV	Analyse
CO4	Implement software solutions by integrating programming concepts of C and Python for real-world engineering applications.	III	Solve

List of Experiments / Lab Activities/Topics

List of Topics (Applicable for Interaction Mode):

Module I: Basics of Problem Solving & C Programming: General Problem Solving Concepts, Types of Problems, Problem Solving Strategies. **Program Design Tools:** Algorithms, Flowcharts and Pseudo-Codes. **C Programming:** Types of programming languages, Features of C, Basic Concepts, Structure of a C Program, Declarations, Constants, Variables, Data Types, Operators and Expressions, Input and Output Functions.

Module II: Decision Control Statements: Conditional Statements: If, If-else, Nested If, If-elseif Statements. **Iterative Statements:** While Loop, For Loop, Do While Loop, Break, Continue, Pass, else Statement used with Loops. **Functions:** Need for functions, Definition, Function Call, Block Structure, Variable Scope, Return Type, Passing Arguments to a Function: Call by Reference, Call by Value, Recursive Functions.

Module III: Array: Declaration, Initialization, Two-Dimensional Arrays, Multi-Dimensional Array. **String**: Declaration and Initialization of Strings, Array of Strings, String functions. **Pointers:** Introduction, Definition and Declaration of Pointers, Address Operator, Pointer Variables.

Module IV: Structures and Unions: Declaration, Initialization, Accessing members of a Structure, Initializing a Union, Accessing the Members of a Union. **File handling:** Concept of a File, Types of File, File Operation, File functions, File opening modes in C, Reading, Write and Closing a File.
Module V: Python Fundamentals: Python variables, constants, literals and operators, python Flow Control statements, Python Data Types, Tuple, Sets and Dictionary,
Module VI: Python Functions: Python Function Arguments, Python Variable Scope and Python Global Keyword, Python Recursion, Python Modules, Python Package and Python Main function. Python Exception Handling, Python Custom Exceptions. File Handling, Python Array, Data Structure.

List of Experiments:

C programming-

1. Program to simulate simple calculator that performs basic tasks such as addition, subtraction, multiplication and division.
2. Program to accept a number from user and print digits of number in a reverse order.
3. Program to find whether the number is positive / negative / zero using conditional statement.
4. Program to accept the number and Compute a) square root of number, b)Square of number, c) Cube of number d) check for prime, d) factorial of number e) prime factors.
5. Program to accept N numbers from user and compute and display maximum in list, minimum in list, sum and average of numbers.
6. Program for Sum of squares of first n natural numbers using mathematical formulae.
7. Program to swap two number using functions (Call by value & reference).
8. Program to print the Fibonacci Series (with & without recursion).
9. Program to find maximum number from the given array.
10. Program to rotate the n array elements to the left by d positions.
11. Program to demonstrate string operations
12. Program to demonstrate structure and union.
13. Program to add two numbers using pointers.
14. Program to find largest element from array using pointers.
15. Program to demonstrate file handling.

Python programming-

1. Python IDE installation and first python program and python comments
2. Programs to study python variables, constants, literals and operators.
3. Programs to study if else statement, for loop, while loop, break, continue and pass statement.
4. Programs to study Numbers, Type Conversion, Mathematics and List.
5. Programs to study Tuple, Sets and Dictionary.
6. Programs to study Python Functions, Python Function Arguments, Python Variable Scope and Python Global Keyword.
7. Programs to study Python Recursion, Python Modules, Python Package and Python Main function
8. Programs to study Python Exceptions, Python Exception Handling and Python Custom Exceptions.
9. Programs to study open, create, read, write and delete operations on a file.
10. Programs to study Arrays and built in methods of Arrays

11. Programs to demonstrate data structure example.
12. Programs to demonstrate web based application.
13.Mini Project

This list serves as a guideline, It may be changed or enhanced by the instructor as needed.

Textbooks	
1	E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.
2	Yashavant Kanetkar, "Lets Us C", BPB Publication, 5th Edition, 20216.
3	R. Nageswara Rao, "Core Python Programming", Dreamtech Press, 2nd Edition, 2017
4	Eric Matthes, "Python Crash Course – A Hands-on, Project-Based Introduction to Programming", No Starch Press, 2nd Edition, 2019
References	
1	Maureen Spankle, "Problem Solving and Programming Concepts", Pearson; 9th edition, ISBN-10: 9780132492645, ISBN-13: 978-0132492645.
2	Herbert Schidt, C: The complete reference, 4th edition, McGraw Hill publication.
3	Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
4	Kenneth Lambert, "Fundamentals of Python: First Programs" Course Technology, Cengage Learning.2nd edition, 2017
Useful Links	
1	https://www.programiz.com/c-programming
2	https://www.w3schools.com/c/c_intro.php
3	https://www.javatpoint.com/c-programming-language-tutorial

CO-PO Mapping

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

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

Assessment

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

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

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

Walchand College of Engineering, Sangli

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Course Information	
Programme	B. Tech. (Electronics Engineering)
Class, Semester	First Year B. Tech., Sem.-II
Course Code	8EN102
Course Name	Analog Electronics
Desired Requisites:	12th Physics

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

Course Objectives	
1	To **explain** the working of diode circuits, transistorized and op-amp based circuits.
2	To **illustrate** the methods used for analysis of transistorized amplifiers.
3	To **illustrate** the methods used for analysis of op-amp based circuits.
4	To **explain** the working of and design methods for voltage regulators.

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	**Solve** the examples on diode circuits, transistors based, and op-amp based circuits.	Apply
CO2	**Analyze** the performance of transistorized amplifiers, and voltage regulators.	Analyze
CO3	**Analyze** the op-amp based circuit applications and applications of IC555 timer.	Analyze

Module	**Module Contents**	**Hours**
I	**Semiconductor Diodes and its Applications:** P-N junction diode, diode characteristics, half-wave and full-wave rectifier, clippers and clampers; Zener diode, LED, Photodiode and Solar Cell.	6
II	**Basics of Transistor:** Transistor structure, types (BJT, FET and MOSFET), transistor configurations, biasing methods, transistor as a switch, Introduction to CMOS circuit.	6
III	**Transistorized Amplifiers:** Amplifier fundamentals, small signal amplifiers: common emitter amplifier, common collector amplifier; JFET/MOSFET common source/ common drain amplifier, frequency response of amplifiers.	8
IV	**Operational Amplifier** Basic op-amp configuration, op-amp powering, feedback in op-amp circuits, ideal op-amp circuit analysis, inverting, non-inverting amplifier, summing amplifier, difference amplifier, unity gain buffer.	8
V	**Op-amp Applications**: Voltage comparator: ZCD and voltage level detector, Schmitt trigger circuit, Wien bridge oscillator, monolithic timer IC555.	6
VI	**Regulated DC Power Supply:** Regulated dc power supply, Zener diode voltage regulator, series and shunt regulator, three terminal IC voltage regulator.	6

Textbooks	
1	Robert Boylestad, Louis Nashelsky, "Electronic Devices and Circuits, 11th edition, Pearson, 2015.
2	Ramakant Gaikwad, "Op-amp and Linear Integrated Circuits", 4th edition, Pearson, 2015.
3	Albert Malvino, David J. Bates, "Electronic Principles", 7th Edition, McGraw Hill Education, 2017.

4	

References	
1	Donald A. Neamen, “Electronic Circuit Analysis and Design”, 3rd edition, Tata McGraw Hill, 2011
2	Robert F. Coughlin and Frederick F. Driscoll, “Operational Amplifiers and Linear Integrated Circuits”, 6th edition, PHI, 2009
3	Donald A. Neamen, “Microelectronics: Circuit Analysis and Design”, 4th Edition, McGraw Hill Education (India) Private Limited, New Delhi, 2021.
4	

Useful Links	
1	https://nptel.ac.in/courses/108101091
2	https://nptel.ac.in/courses/108108112
3	https://nptel.ac.in/courses/122106025
4	https://nptel.ac.in/courses/117103063

CO-PO Mapping

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

Walchand College of Engineering, Sangli

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Course Information	
Programme	B. Tech. (Electronics Engineering)
Class, Semester	First Year B. Tech., Sem.-II
Course Code	8EN152
Course Name	Analog Electronics Lab
Desired Requisites:	12th Physics

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** knowledge of electronic components and circuits to first year engineering students, so that they can understand, design and implement simple electronic circuits.
2	To **explain** the working of electronic circuits like rectifiers and amplifiers (voltage and current) using BJT, FET and MOSFETs.
3	To **illustrate** the methods used for analysis and design of op-amp based circuits.
4	To **explain** the working of regulated dc power supplies.

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	**Identify and explain** use of electronics components and instruments.	Understand
CO2	**Explain** the working of diode circuits, transistorized and op-amp based amplifiers.	Understand
CO3	**Construct** diode, transistor and op-amp based circuits.	Apply
CO4	**Build and Test** simple electronic circuits using op-amp and IC555.	Apply

List of Experiments / Lab Activities/Topics

List of Topics (Applicable for Interaction mode):

List of Lab Activities: (minimum 08 experiments)

1. Study of p-n junction diode characteristics.
2. Analyze the performance diode rectifier circuits.
3. Study of diode based clipper and clamper circuits
4. Study of transistor as a switch and amplifier (BJT, JFET, and MOSFET).
5. Study of common emitter/common source amplifier.
6. Study of common collector/common drain amplifier.
7. Study of inverting and non-inverting amplifier using op-amp.
8. Implementation of op-amp based applications (adder / subtractor).
9. Analyze the performance of waveform generators using op-amp.
10. Build and test multivibrator/ timer circuits using IC 555.
11. Study of regulated dc power supply (Zener diode voltage regulator/ three terminal IC voltage regulator).

Textbooks	
1	Robert Boylestad, Louis Nashelsky, 11th edition, "Electronic Devices and Circuits, Pearson, 2015.
2	Ramakant Gaikwad, "Op-amp and Linear Integrated Circuits", 4th edition, Pearson, 2015.
3	Albert Malvino, David J. Bates, "Electronic Principles", 7th Edition, McGraw Hill Education, 2017.
4	

References	
1	Donald A. Neamen, "Electronic Circuit Analysis and Design", 3rd edition, Tata McGraw Hill, 2011

2	Robert F. Coughlin and Frederick F. Driscoll, “Operational Amplifiers and Linear Integrated Circuits”, 6th edition, PHI, 2009
3	Donald A. Neamen, “Microelectronics: Circuit Analysis and Design”, 4th Edition, McGraw Hill Education (India) Private Limited, New Delhi, 2021.
4	
Useful Links	
1	https://nptel.ac.in/courses/122106025
2	https://nptel.ac.in/courses/108101091
3	https://nptel.ac.in/courses/108105113
4	

CO-PO Mapping

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

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

Assessment

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

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

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

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Course Information	
Programme	B. Tech. (Electronics Engineering)
Class, Semester	First Year B. Tech., Sem.- II
Course Code	8VS158
Course Name	Software Tools For Electronics
Desired Requisites:	Basic Simulation Tools

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

Course Objectives	
1	To introduce students to software tools used in electronics design and simulation.
2	To develop skills in circuit design, PCB design, and embedded system development.
3	To familiarize students with industry-standard EDA (Electronic Design Automation) tools.
4	To enable students to analyze and simulate electronic systems before hardware implementation.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	**Identify** and utilize appropriate software tools for electronics design and development.	Apply
CO2	**Design** and **simulate** electronic circuits using EDA tools for functional verification.	Create
CO3	**Design** PCB layouts and **develop** embedded applications using industry-standard development environments.	Create
CO4	**Analyze** simulation results and optimize electronic system performance before hardware realization.	Analyze

List of Experiments / Lab Activities/Topics

List of Topics (Applicable for Interaction mode):

1.Introduction to Software Tools for Electronics Engineering:
Overview of EDA Tools, Design Flow in Electronics Product Development,
Introduction to Simulation and Modelling, Open Source and Commercial Software, Tools, Installation and Configuration of Software Tools

2.Circuit Design and Simulation:
Analog Circuit Simulation, Digital Circuit Simulation, Schematic Capture Techniques, Transient, AC and DC Analysis, Waveform Analysis and Debugging (Software Tools LTspice, Multisim Proteus)

3. PCB Design Tools:
PCB Design Process, Component Libraries and Footprints, PCB Layout Rules, Routing Techniques, Gerber File Generation (Software tools KiCad, Altium Designer, EAGLE)

List of Lab Activities:

Exp. No.	Experiment Title
1	Installation and familiarization of LTspice, KiCad, Arduino IDE
2	Simulation of basic DC resistive circuits using LTspice/Multisim and verification of Ohm's Law.
3	Simulation and analysis of RC and RL circuits using transient analysis.
4	Design and simulation of diode rectifier circuits and waveform analysis.
5	Design and simulation of combinational logic circuits using Proteus/Multisim.
6	Design and simulation of sequential circuits (flip-flops/counters) using Proteus.
7	Creation of schematic diagrams using KiCad/EAGLE schematic editor.
8	Development of PCB layout for a simple electronic circuit using KiCad/EAGLE.
9	Application of PCB design rules and generation of Gerber files for manufacturing.
10	Design, simulate, and create PCB layout for a simple electronic application (e.g., regulated power supply, LED flasher, or sensor interface circuit).

Textbooks	
1	Circuit Design and Simulation Quick Start Guide: Create Schematics and Layout Electronic Components (Maker Innovations Series) by Ashraf Said Ahmad AlMadhoun (Author)
2	Complete PCB Design Using OrCAD Capture and PCB Editor by Kraig Mitzner , Bob Doe , Alexander Akulin , Anton Suponin , Dirk Müller

References	
1	KiCad 10 Advanced Design Guide : Beginner-to-Advanced Guide to Circuit Design, PCB Layout, Gerber Generation, and Electronics Manufacturing (The Complete Developer Series Book 2)
2	Practical Pcb Design: A Hands-on Guide to Developing Printed Circuit Boards by Michael D. Smith

Useful Links	
1	www.nptel.com
2	www.udemy.com
3	www.embedded.com
4	www.cicuitdesign .com

CO-PO Mapping

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

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

Assessment

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

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

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