Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2023-24

Course Information

Programme	B. Tech. (Electronics Engineering)
Class, Semester	First Year B. Tech., Sem.- I
Course Code	7MA101
Course Name	Engineering Mathematics-I
Desired Requisites:	Mathematics course at Higher Secondary Junior College

Teaching Scheme		Examination Scheme (Marks)			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	1 Hrs/week	30	20	50	100
		Credits: 04			

Course Objectives

1	Introduce the basic concepts required to understand, construct, solve and interpret various types of differential equation.
2	Improve the Mathematical skill for enhancing logical thinking power of students
3	Acquire knowledge with a sound foundation in Mathematics and prepare them for graduate.
4	

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Explain mathematical concepts in engineering field.	Understanding
CO2	Solve engineering and scientific problems.	Applying
CO3	Applying the Mathematical concept in Engineering field	Applying
CO4		

Module	Module Contents	Hours
I	**Matrices** Rank of matrix, Homogeneous and non-homogeneous linear equations, Eigen values, Eigen vectors, Cayley Hamilton theorem, Diagonalizations of matrices.	6
II	**Partial Differentiation and its application** Partial derivative, chain rule for partial differentiation, Euler's theorem for homogeneous and non-homogeneous function, Jacobian, Error and approximation, maxima and minima of function of two variables	8
III	**Complex Number**Polar form of complex number, Argand's diagram, De Moiver's theorem, roots of complex number, Hyperbolic function, relation between circular and hyperbolic function.	7

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IV	**First order ordinary differential equation and its application** Exact, Linear, Bernoulli's equations, Euler's equations, Orthogonal trajectory, applications to simple electric circuit.	7
V	**Numerical Solution of Ordinary Differential Equations of first order and first degree:** Numerical Solution by (i) Taylor's series method (ii) Euler's method (iii) Modified Euler's method (iv) Runge- Kutta fourth order method	6
VI	**Calculus** Rolle's theorem, Mean value theorem, Taylor's and Maclaurin's theorem with remainders	**5**

	Textbooks
1	P. N. and J. N. Wartikar "A Text Book of Applied Mathematics, Vol I and II, Vidyarthi Griha Prakashan, Pune, 2006.
2	B .S. Grewal "Higher Engineering Mathematics", , Khanna Publication, 44th Edition, 2017.
3	
4	

	References
1	Erwin Kreyszig , "Advanced Engineering Mathematics", , Wiley Eastern Limited Publication, 10th Edition, 2015.
2	Wylie C.R *"Advanced Engineering Mathematics"*,., Tata McGraw Hill Publication, 8th Edition 1999.
3	H. K. Dass, *"Advanced Engineering Mathematics"*, S. Chand & Company Ltd., 1st Edition, 2014.
4	B.V.Ramana, "Higher Engineering Mathematics ", The McGraw Hill companies, 2006.

	Useful Links
1	https://nptel.ac.in/courses/111105121
2	
3	
4	

CO-PO Mapping

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

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 2023-24

Course Information

Programme	First Year B. Tech. (Electronics Branch)
Class, Semester	First Year B. Tech., Sem I
Course Code	7EL106
Course Name	Basic Electrical Engineering
Desired Requisites:	NIL

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

Course Objectives

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

Course Outcomes (CO) with Bloom's Taxonomy Level

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

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

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 powers transfer Theorems.	8
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 and three-phase balanced circuits. Voltage and current relations in star and delta.	7
III	**Module 3: DC Machines** Construction, working principle and types of DC generator and Motor. Voltage and speed control methods, Speed-Torque characteristics. Principle, construction, working and application of Permanent Magnet DC Motor, stepper motors, servo motors and universal motors.	6
IV	**Module 4: Transformers** Review of DC & AC Magnetic circuits, Construction, working principle and types of single-phase transformer, open circuit and short circuit tests: Losses, efficiency, all-day efficiency and regulation. Autotransformer.	6
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.	6

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.	6

	Textbooks
1	D.C. Kulshreshtha, "Basic Electrical Engineering", 1st revised edition McGraw Hill, 2012.
2	D.P Kothari and I.J Nagrath, "*Basic Electrical Engineering*", Tata McGraw Hill, 2010.
3	B.L Theraja "A Textbook of Electrical Technology", S Chand Publication, 2013.
	References
1	V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.
2	E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
3	V. N. Mittle and Arvind Mittal, "Basic Electrical Engineering", 2nd edition, Tata McGraw Hill.
	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, 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"

CO-PO Mapping

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

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AY 2023-24

Course Information	
Programme	B. Tech. (Electronics Engineering)
Class, Semester	First Year B. Tech., Sem.-I
Course Code	7EN101
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
		Credits: 2			

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 diode circuits, and transistor based circuits.	Analyze
CO3	**Analyze** the op-amp based circuits considering ideal op-amp and also with effect of practical limitations of op-amp on the circuit output.	Analyze
CO4	**Evaluate** the performance of op-amp based waveform generators and voltage regulators.	Evaluate

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.	9
V	**Op-amp Applications**: Voltage comparator, Schmitt trigger circuit, multivibrators, effect of positive feedback, types of oscillator, RC oscillators, monolithic timers (IC555).	5
VI	**Regulated DC Power Supply:** Block diagram of regulated dc power supply, Zener diode voltage regulator, series and shunt regulator, op-amp based voltage regulator, switching regulators.	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	12	1	2
CO1	2	2												2
CO2	2	3												2
CO3	2	3												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

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 2023-24

Course Information	
Programme	B. Tech. (Electronics Enginering)
Class, Semester	First Year B. Tech. Sem.- I
Course Code	7CH155
Course Name	Engineering Chemistry Lab
Desired Requisites:	Chemistry course at secondary and higher secondary level

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	2Hrs/ Week	**LA1**	**LA2**	**Lab ESE**	**Total**
Interaction	0Hrs/ Week	30	30	40	100
		Credits: 1			

Course Objectives	
1	To make the student familiar with analytical techniques.
2	To provide hands on practice of Instrumental and titrimetric analysis.

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 principles of Volumetry/gravimetry to quantitative analysis for water quality parameter, metal and alloys.	III	Applying
CO2	Demonstrate use of instrument for quantitative analysis.	III	Applying
CO3	Experiment physical/Chemical characteristics of material. Execute preparation of product.	III	Applying

List of Experiments (Minimum 8 experiments from the following list)

Sr. No	**List of Experiments**	**Hours**
1	Estimation of hardness of water by EDTA method (Complexometric Titration).	2 Hrs. each Expt.
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 & pH metric titration.	
6	Determination of strength of acid/base by 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 of given liquid. by 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	
List of Topics(Applicable mode):		
	Verification of Calcium content from Cement/ Limestone/Eggs shells/Calcium tablet.	

Textbooks	
1	College Practical Chemistry, V K Ahaluwaliya. Sunita Dhingra, Adarsha Gulati , Universities Press.
2	Laboratory Manual on Engineering Chemistry by Sudha Rani And S.K. Bashin, Dhanpat Rai& Co.
References	
1	Engineering Chemistry Laboratory Manual, Department of Chemistry WCE, Sangli.
2	J Mendham, R.C. Denney, J.D. Barnes, M.J.K Thomas, "Quantitative Chemical analysis", Vogels, Pearson Education, 2008, 6th Edition.
Useful Links	
1	https://www.lccc.edu/academics/science-and-engineering/science-in-motion/labs-equipment/chemistry-lab-experiments
2	https://edu.rsc.org/resources/collections/classic-chemistry-experiments

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3													
CO2	3													
CO3	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	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, 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 2023-24

Course Information

Programme	B. Tech. (Electronics Engineering)
Class, Semester	First Year B. Tech., Sem.-I
Course Code	7ME108
Course Name	Engineering Graphics
Desired Requisites:	Basic Knowledge of Computer

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

Course Objectives

1	To impart the techniques of engineering graphics.
2	To prepare the students for applying knowledge of engineering graphics in real life drawings.
3	To develop the skills of students for evaluating CAD software for its applications

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Understand the basic principle of Engineering graphics.	II	Understanding
CO2	Draw different views of components using the first angle projections method.	III	Applying
CO3	Apply the knowledge of engineering graphics in real life applications.	III	Applying

List of Experiments / Lab Activities

List of Experiments:

Submission of drawing on following topics (Any two sheets on CAD)

1: Plane Curves and Conic Sections (Min. 5 Problems)
2: Projections of Points and Lines (Min. 5 Problems)
3: Projections of Planes and Solids (Min. 6 Problems)
4: Development of Lateral Surfaces (Min. 3 Problems)
5: Orthographic Projections (Min. 2 Problems)
6: Isometric Projections (Min. 2 Problems)

Text Books

1	Bhatt N.D., Panchal V.M. and Ingle P.R., Engineering Drawing, Charotar Publishing House, 2014
2	Shah, M.B. and Rana B.C., Engineering Drawing and Computer Graphics, Pearson Education, 2008.
3	Agrawal B. and Agrawal C. M., Engineering Graphics, TMH Publication, 2012.

References

1	Narayana, K.L. and P Kannaiah, Text book on Engineering Drawing, Scitech Publishers, 2008.
2	Warren J. Luzzader, Fundamentals of Engineering Drawing, Prentice Hall of India, New Delhi, 2010
3	Fredderock E. Giesecke, Alva Mitchell others, Principles of Engineering Graphics, Maxwell McMillan Publishing, 2010

Useful Links

1	https://nptel.ac.in/courses/112/103/112103019/

2	https://nptel.ac.in/courses/105/104/105104148/
3	https://www.youtube.com/watch?v=xXdpkQXDuMw&list=PL9RcWoqXmzaJT-fliqTSwUjWU4zCX_H2A

CO-PO Mapping For Electrical Engineering Department															
	Programme Outcomes (PO)												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
CO1	2				1					1		1			
CO2			1												
CO3					2					1					
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															

CO-PO Mapping Electronics Engineering Department															
	Programme Outcomes (PO)												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
CO1	1				1					1					
CO2			1												
CO3					2					1					
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															

CO-PO Mapping Computer Science and Engineering Department															
	Programme Outcomes (PO)												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
CO1					3					1		1			
CO2			1												
CO3					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 Information Technology Department															
	Programme Outcomes (PO)												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
CO1					3					1		1			
CO2			1												
CO3					3					1					
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															

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 2023-24

Course Information

Programme	B.Tech. (Electronics Engineering)
Class | Semester	First Year B. Tech | Semester-I
Course Code	7CS107
Course Name	Computer Programming (C Programming)
Desired Requisites:	-

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	2 Hrs/ Week	**LA1**	**LA2**	**Lab ESE**	**Total**
Interaction	2 Hrs/ Week	30	30	40	100
		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	To understand the basics of problem solving and C programming.	II	Understand
CO2	To translate the algorithms to programs (in C language).	III	Applying
CO3	To test and execute the C programs and correct syntax and logical errors.	IV	Analyse

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.

Module III: 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 IV: Array: Declaration, Initialization, Two-Dimensional Arrays, Multi-Dimensional Array. **String**: Declaration and Initialization of Strings, Array of Strings, String functions.

Module V: Pointers: Introduction, Definition and Declaration of Pointers, Address Operator, Pointer Variables. **Structures and Unions:** Declaration, Initialization, Accessing members of a Structure, Initializing a Union, Accessing the Members of a Union.

Module VI: File handling: Concept of a File, Types of File, File Operation, File functions, File opening modes in C, Reading, Write and Closing a File.

List of Experiments:

1. Program to simulate simple calculator that performs basic tasks such as addition, subtraction, multiplication and division.
2. Program to demonstrate different operators and their order precedence.
3. Program to accept the number and Compute a) square root of number, b) Square of number, c) Cube of number d) check for prime, d) factorial of number e) prime factors.
4. Program to accept a number from user and print digits of number in a reverse order.
5. Program to accept two numbers from user and compute smallest divisor and Greatest Common Divisor of these two numbers.
6. Program to find whether the number is positive / negative / zero using conditional statement.
7. Programs to show different types of iteration / loop.
8. Program to accept N numbers from user and compute and display maximum in list, minimum in list, sum and average of numbers.
9. Program to print the Fibonacci Series (with & without recursion).
10. Program to swap two number using function (Call by value & reference).
11. Program to demonstrate structure to array.
12. Program to demonstrate structure and union.
13. Program to demonstrate file handling.

Textbooks	
1	E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.
2	Yashavant Kanetkar, "Lets Us C", BPB Publication, 5th Edition, 20216.
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
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	12	1	2
CO1	3	2												
CO2	1		2		2									
CO3		2	1	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, 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.				

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AY 2023-24

Course Information

Programme	First Year B. Tech. (Electronics Branch)
Class, Semester	First Year B. Tech., Sem I
Course Code	7EL156
Course Name	Basic Electrical Engineering Lab
Desired Requisites:	NIL

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

Course Objectives

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

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	**Describe** basic concepts of electrical circuits and various theorems.	II	Understanding
CO2	**Demonstrate** the use of transformers and AC/DC machines.	III	Applying

List of Experiments / Lab Activities/Topics

List of Topics(Applicable for Interaction mode):

1. To study AC and DC machines parts and their functions.
2. Study of AC/DC motor starters.
3. To study servo motor/ steeper motor with application.
4. Study of installation techniques using fuse, MCB and MCCB.

List of Lab Activities:

1. Electrical Safety Measures.
2. To study series-parallel RL, RC and RLC circuits
3. To verify KVL and KCL theorems.
4. To study speed control techniques of dc motor.
5. To study speed control techniques of induction motor.
6. To perform load test on transformer.
7. Find out equivalent resistance in series and parallel connection.
8. Measure voltage, current and power in single phase R-C series circuit.
9. Measure Voltage, current and power factor of 1-phase A.C R-L series circuit.

Textbooks

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

References

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

Useful Links

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

CO-PO Mapping														
	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3													
CO2	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	7EN151
Course Name	Analog Electronics Laboratory
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	

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 (multivibrator/ oscillator) using op-amp.
10. Build and test multivibrator/ timer circuits using IC 555.
11. Study of regulated dc power supply (Zener diode voltage regulator/ op-amp based linear 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	12	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.-I
Course Code	7VS152
Course Name	Engineering Skills-II
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 provide basic knowledge of handling electrical equipment and safety.
2	To impart skills to plan and implement simple electrical wiring.
3	To **provide** exposure to the students with hands on experience on various basic engineering practices in Electrical and Electronics Engineering.
4	To explain the working of small electronic gadget like electronic bell, emergency lamp etc.

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	**Identify** the instruments for measurement of electrical parameters.	I	Remembering
CO2	**Illustrate** working of switchgear for electrical safety and protections.	III	Applying
CO3	**Identify and explain** the use of electronic instruments.	II	Understanding
CO4	**Build and Test** simple electronic gadget.	III	Applying

List of Experiments / Lab Activities/Topics

List of Lab Activities: (minimum 08 experiments)

Engineering Skills (Electrical)

Module 1:

i. Measurement of Electrical Parameters in DC Circuits.

ii. Measurement of Electrical Parameters in Single Phase AC Circuits.

Module 2:

i. Study of various types of wires and cables.

ii. Basic wiring schemes for residential and industrial applications.

iii. Demonstrate the operation of fuse, MCCB, ELCB

Module 3:

i. Preparation of Earthing Pit for Electrical Installation Safety.

ii. Dismantling, Assembly and Fault Finding of Ceiling Fans / Table Fans, Automatic Electric Iron, Plate Tube Water Heater, Use of Megger.

Engineering Skills (Electronics)

Module 1: Introduction to Lab Instruments like CRO, Power supply, Oscillator, Multi meter. Frequency measurement, AC-DC voltage measurement using CRO and multi meter

Module 2: Study of components (Resistance, capacitor, Diode, Transistor, Transformer, switches, relays, PCB etc.) testing and lead identification

Module 3: Electronics Gadget building & testing (Gadget must work)

Textbooks	
1	Make: Electronics, by Charles Platt, Published by Maker Media, 2015
2	Electronics Projects For Dummies, by by Earl Boysen and Nancy Muir, Published by Wiley Publishing, Inc., 2006
3	D.C. Kulshreshtha, “Basic Electrical Engineering”, 1 st revised editionMcGraw Hill, 2012.
4	D.P Kothari and I.J Nagrath, “Basic Electrical Engineering”,Tata McGraw Hill, 2010.
References	
1	Paul Horowitz, Winfield Hill, “The Art of Electronics”, Cambridge University Press, 1989
2	E-learning material through Intranet/Internet
3	V. N. Mittle and Arvind Mittal, “Basic Electrical Engineering”, 2 nd edition, Tata McGraw Hill.
4	
Useful Links	
1	
2	
3	
4	

CO-PO Mapping														
	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1			1		2				1				1	
CO2			1		2				1				1	
CO3				2					1					1
CO4				2					1					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.-II
Course Code	7MA103
Course Name	Engineering Mathematics-II
Desired Requisites:	Mathematics course at Higher Secondary Junior College

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	1 Hrs/week	30	20	50	100
		Credits: 04			

Course Objectives	
1	Familiarize the students with techniques in multivariate integration and Differential equation.
2	Awareness about Mathematics fundamental necessary to solve and analyse the Engineering problem
3	
4	

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	Understand the Mathematical Tools that are needed to solve Engineering problem	Understanding
CO2	Solve the problems in multivariable calculus,	Applying
CO3	Apply the statistical technique to interpret the data	Applying
CO4		

Module	**Module Contents**	**Hours**
I	**Beta-Gamma Functions:** Definition of Beta, Gamma functions and properties of Beta Gamma functions	**6**
II	**Curve tracing** Tracing of curves for Cartesian and polar coordinate	**6**
III	**Multivariable Calculus:** Multiple Integrals: Double integrals, change of order of integration, change of variables (Cartesian to polar) Evaluation of triple integrals, Application of Multiple integrals such as Area enclosed by plane curves, Mass of lamina, Volume of solid.	**8**
IV	**Linear Differential equations of nth order with constant coefficient:** Linear Differential equation with constant coefficient, Complementary function, Particular Integral	**8**
V	**Applications of L.D.E with constant Coefficient:** Applications of L.D.E with constant Coefficient to Electrical Engineering	**4**
VI	**Statistics:**	

	Correlation, Linear regression, Curve fitting (a) straight line (b) logarithmic curve,	**7**
Textbooks		
1	P. N. and J. N. Wartikar, "A Text Book of Applied Mathematics", Vol I and II", Vidyarthi Griha Prakashan, Pune, 2006	
2	B .S. Grewal , "Higher Engineering Mathematics", Khanna Publication, 44th Edition , 2017.	
3	S.C. Gupta, "Fundamentals of Mathematical Statistics and probability", Sultan chand &Sons,2014.	
4		
References		
1	Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley Eastern Limited Publication, 2015, 10th Edition	
2	Wylie C.R, "*Advanced Engineering Mathematics",* Tata McGraw Hill Publication, 8th Edition, 1999	
3	H. K. Dass *, "Higher Engineering Mathematics",* S. Chand & Company Ltd., 1st Edition 2014.	
4	S. S. Sastry, *"Engineering Mathematics (Volume-I)",* Prentice Hall Publication, 3rd Edition 2006	
Useful Links		
1	https://www.youtube.com/watch?v=KgItZSst2sU	
2	https://nptel.ac.in/courses/111105121	
3		
4		

CO-PO Mapping														
	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2			1										
CO2	2			1										
CO3	2			1										
CO4														
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	7PH102
Course Name	Engineering Physics
Desired Requisites:	Students are expected to know the basic concept in Physics.

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	03Hrs/week	MSE	ISE	ESE	Total
Tutorial	0 Hrs/week	30	20	50	100
		Credits: 3			

Course Objectives	
1	To provide basic concepts to solve many engineering and technical issues.
2	To give deep insights into the understanding of engineering courses.
3	To encourage them to understand engineering and technical 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	Exhibit memory of previously learned information by recalling facts, terms, basic concepts in Wave Optics, Modern Physics and Quantum Mechanics, Ultrasonic, Semiconductors, Instrumentation and Transducer, Microchip Design.	1	Remembering
CO2	Demonstrate understanding of facts and ideas by recalling, comparing, interpreting for all terms in these modules.	2	Understanding
CO3	Solve problems to new situations by applying acquired knowledge, facts, techniques and rules for various concepts in a different way.	3	Applying

Module	**Module Contents**	**Hours**
I	**Wave optics:** Introduction, interference of light, Newton's rings, Fresnel's diffraction: Fresnel's half-period zones, zone plate and diffraction at a straight edge. Fraunhofer's diffraction: Diffraction due to single slit, Diffraction due to double slits, Plane diffraction grating.	6

II	**Modern Physics and Quantum mechanics:** Introduction, black body radiation, Planck's quantum theory, Wien's displacement law and Rayleigh – Jeans law, phase velocity, group velocity and particle velocity, de-Broglie's hypothesis, Photoelectric effect, Compton effect, Heisenberg's uncertainty principle and applications, wave function and physical significance, Schrödinger's wave equation: time dependent and time independent, Eigen value and Eigen function.	8
III	**Ultrasonic:** Introduction, generation of ultrasonic waves (Magnetostriction and Piezoelectric method), detection of ultrasonic waves by Kundt's tube, thermal detection and sensitive flame method, velocity of ultrasonic waves in liquid, applications of ultrasonic waves in scientific and engineering field.	6
IV	**Semiconductors:** 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, basic concept of p-n junction.	7
V	**Instrumentation and Transducers:** Introduction, instrumentations, measurement system, control system, Transducer and Sensor: transducers, sensors, classification of transducers, characteristics of transducers, selection criterion for transducers, temperature transducers, strain gauge, pressure transducers, force transducers, optical transducers and actuators.	6
VI	**Microchip Design:** Introduction, Crystal growth, Epitaxial diffusion process, types of integrated circuit, Development of integrated components (diode, transistor, resistor and capacitor), Implementation in integrated circuit.	6

Textbooks	
1	M. N. Avadhanulu and P. G. Kshirsagar, "A Text book of Engineering Physics", S.Chand Pub.
2	R. K. Gaur and S. L. Gupta "Engineering Physics", Dhanpat Rai Publications, 2011

References	
1	Halliday, Resnic and Walker, "Fundamentals of Physics", John Wiley, 9th edition 2011.
2	A. Beiser, "Concepts of Modern Physics", McGraw Hill International, 5th edition, 2003.
3	Ajoy Ghatak, "Optics", Tata McGraw Hill 5th edition, 2012.
4	Halit Eren, John G. Webster "Measurement, Instrumentation, and Sensors Handbook" CRC Press 2018
5	Yaguang Lian "Semiconductor Microchips and Fabrication: A Practical Guide to Theory and Manufacturing" Wiley 2022

Useful Links	
1	For optics https://nptel.ac.in/courses/122/107/122107035/
2	For Quantum Physics https://nptel.ac.in/courses/122/106/122106034/
3	For Ultrasonic https://freevideolectures.com/course/3531/engineering-physics-i/8
4	For Solid State Physics https://nptel.ac.in/courses/115/105/115105099/
5	For Instrumentation and Transducers https://youtu.be/1uPTyjxZzyo
6	For Microchip Design https://youtu.be/HdcLRMv3D3g

CO-PO Mapping

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

CO1	2													
CO2	2													
CO3	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 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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Course Information

Programme	B.Tech. (CSE, IT, Electrical , Electronics)
Class, Semester	First Year B. Tech., Sem I/II
Course Code	7AM102
Course Name	Engineering Mechanics
Desired Requisites:	Physics

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

Course Objectives

1	To impart knowledge on fundamentals of mechanics
2	To provide knowledge of basic concepts and system of forces in statics and dynamics
3	To illustrate the principles of mechanics in engineering applications

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Description
CO1	Explain fundamental concepts in statics and dynamics	II	Understanding
CO2	Apply fundamental concepts of mechanics to solve problems on static systems	III	Applying
CO3	Use Newton's laws of motion, D'Alemberts and work energy principles to solve problems related to dynamic systems	III	Applying

Module	Module Contents	Hours
I	**Force System:** Fundamentals, Systems, Composition and Resolution, Resultant of planar force systems. Free Body Diagram, Laws of Forces, Varignon's Theorem, Lami's Theorem	5
II	**Equilibrium:** Concepts of determinacy and indeterminacy, Equilibrium of beams, Supports, Loads, Equilibrium, Reactions Principle of Virtual Work and its applications to statically determinate beams	4
III	**Centroid and Moment of Inertia** Centre of gravity and Centroid, Moment of Inertia of Plane figure, Composite Sections, Radius of gyration, Mass-Moment of Inertia.	5
IV	**Kinematics of Particles** Rectilinear motion of particle, Equations of motion, Motion under gravity, Relative Motion, Relation between linear and angular motion, Motion of a Projectile.	5
V	**Kinetics of Particles** Friction: Laws of friction, application of laws of friction, wedge friction, Newton's laws of motion, D'Alemberts principle, Applications to rough inclined plane, lift, and connected bodies, Circular motion, Rotation of rigid bodies	4

VI	**Work Energy and Impact** Work energy Principle, Potential and Kinetic Energy, Law of Conservation of Energy, Impulse Momentum Method Collisions: Impact, Collision of bodies, Coefficient of Restitution, Loss of Kinetic Energy due to Impact	5

Textbooks

1	Ramamrutham., S. "Textbook of Applied Mechanics", Dhanpat Rai Publishing Company Limited, 2008.
2	Bhavikatti., S. S. and Rajashekarappa., K. G. "Engineering Mechanics", New Age International Publishers, 2015, 5th Edition.
3	Beer, F. P. and Johnston, E. R. "Vector Mechanics for Engineers Vol. I and II", McGraw Hill Company Publication, 2011, 9th Edition.

References

1	Singer, F. L. "Engineering Mechanics Statics & Dynamics", B. S. Publications, 2011.
2	Timoshenko, S. and Young, D. H. "Engineering Mechanics", McGraw Hill Companies, 2008, 4th Edition.
3	Meriam, L. and L.G. Kraige, "Engineering Mechanics – Dynamics", John Wiley & Sons, 2002, 6th Edition.

Useful Links

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

CO-PO Mapping

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

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

Assessment

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

B.B. Sawant

Walchand College of Engineering, Sangli

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AY 2023-24

Course Information

Programme	B. Tech. (Electronics Engineering)
Class, Semester	First Year B. Tech., Sem.-II
Course Code	7CM106
Course Name	Civil & Mechanical Engineering
Desired Requisites:	

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

Course Objectives

1	To provide a solid grounding in the fundamental principles and concepts of mechanical engineering, including mechanics, thermodynamics, materials science, and fluid mechanics.
2	To introduce students to the field of mechanical engineering, its history, scope, and its importance in various industries.

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	Identify suitable materials for engineering applications, understand basic manufacturing processes, and understand mechanical engineering applications in various industries and be aware of current industry practices and standards.	II	Understanding
CO2	Apply problem-solving techniques to analyze and solve basic engineering problems related to mechanical systems and components	III	Applying

Module	**Module Contents [Mechanical]**	**Hours**
I	Introduction Engineering Materials, Properties of engineering materials (metals, polymers, ceramics) Material selection considerations for computer hardware and robotics applications Material testing and characterization techniques, Overview of manufacturing techniques (casting, machining, molding, etc.) Rapid prototyping methods (3D printing, laser cutting, etc.) for computer hardware prototypes.	6
II	Thermodynamics and Heat Management, Basic concepts of thermodynamics and heat transfer Heat dissipation and thermal management in computer hardware, Electronic Packaging and Cooling Packaging considerations for computer components and devices Cooling strategies for high-performance computer hardware	6
III	Introduction to Robotics, Basics of robotics and its integration with computer engineering, Overview of robotic mechanisms and control system, Gears, pulleys, belts, and other power transmission elements Bearings and lubrication Linkages and mechanical movements relevant to computer engineering	5
Module	**Module Contents [Civil]**	**Hours**

I	**Module 1: Introduction to Civil Engineering** Scope of civil engineering, Disciplines of civil engineering Role of Civil Engineers in infrastructure development Building Systems: Conceptualization, Need for buildings, Defining Sustainability for Building systems, Structural systems; Load bearing, Framed, Prefabricated, Pre Engineered Construction, Loads on Building, Components in Buildings and their functions, building bye laws, Principle of building planning	5
II	**Module 2: Construction Materials** Construction materials and classification Properties and uses of stone, brick, tile, timber, cement, sand, lime, mortar, concrete, bitumen and steel.	4
III	**Module 3: Urban Infrastructure** Urban Planning and Infrastructure, Transport systems, Water supply and drainage, Waste management facilities, Concept of smart city	4

Text Books[Mechanical]	
1	Materials Science and Engineering: An Introduction" by William D. Callister Jr. and David G. Rethwisch, 10th ed. 2018 edition, Wiley.
2	Thermodynamics: An Engineering Approach" by Yunus A. Çengel and Michael A. Boles, 8th edition.2017, McGrahill
Text Books[Civil]	
1	Bhavikatti S.S "Basic Civil Engineering", I.K. International Publishing House Pvt. Ltd.
2	Hirasakar G. K., "Basic Civil Engineering", DhanpatRai publications, 1st Edition,2007
3	Gole L.G., "Introduction to Civil Engineering", Mahu Publisher House, 4th Edition, 2005
References[Mechanical]	
1	Manufacturing Engineering and Technology (SI Edition), Serope Kalpakjian , Steven R. Schmid, SI edition, 2018, Pearson
References[Civil]	
1	Bindra S.P., Arora S.P. , "Building Construction", Dhanpat Rai publication, 5th edition, 2012
2	Smart Cities Mission Statement & Guidelines, Ministry of Urban Development Government of India
Useful Links[Mechanical]	
1	https://ocw.mit.edu/courses/mechanical-engineering/
2	https://www.coursera.org/browse/engineering/mechanical-engineering
3	https://www.edx.org/learn/mechanical-engineering

CO-PO Mapping For Electrical Engineering Department															
	Programme Outcomes (PO)												**PSO**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
CO1	2				1					1		1			
CO2			1												
CO3					2					1					
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															

CO-PO Mapping Electronics Engineering Department															
	Programme Outcomes (PO)												**PSO**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
CO1	1				1					1					
CO2			1												

CO3					2					1					
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															

CO-PO Mapping Computer Science and Engineering Department															
	Programme Outcomes (PO)												**PSO**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
CO1					3					1		1			
CO2			1												
CO3					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 Information Technology Department															
	Programme Outcomes (PO)												**PSO**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
CO1					3					1		1			
CO2			1												
CO3					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 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 2023-24

Course Information	
Programme	B. Tech. (Electronics Engineering)
Class, Semester	First Year B. Tech., Sem. -II
Course Code	7EN102
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	Student should able to know the number systems
2	Know about the logic gates how to use in combinational and sequential circuits
3	Able to distinguish 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	Understand the number system to be used in the digital systems	Understand
CO2	Understand combinational circuits	Understand
CO3	Understand the sequential circuits	Understand
CO4	Able to design small digital blocks	Create
CO5	Understand the sequential circuits using state diagram	Understand

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.	8
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	8
III	**Module 3: Combinational Circuits** Design of comparator, Adder/subtractor, Code converters, Introduction to MUX / DEMUX	7
IV	**Module 4 : Module 4 Sequential Circuit** flip-flop, asynchronous counters. Mod N Counters, BCD counters, Mealy Machine & Moore Machine	7
V	**Module 5: State Diagram** State diagram, State assignment, State Reduction. Merger Char methods	6
VI	**Module 6 : Algorithmic State Machine** Introduction, components, features, examples of ASM charts	3

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	http://learn-aboutelectronics.com
2	

CO-PO Mapping														
	Programme Outcomes (PO)												**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2													
CO2		2												
CO3														
CO4			2											2
CO5		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 2023-24

Course Information

Programme	B. Tech. (Electronics Engineering)
Class, Semester	First Year B. Tech., Sem.-II
Course Code	7PH155
Course Name	Engineering Physics Lab.
Desired Requisites:	Students are expected to know the basic practical knowledge up to HSC

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

Course Objectives

1	To gain practical knowledge by applying the experimental methods to correlate with the physics theory.
2	To learn the usage of electrical and optical systems for various measurements.
3	To Apply the analytical techniques and graphical analysis to the experimental data.

Course Outcomes (CO) with Bloom's Taxonomy Level

CO1	Calculate the diameter of the thin wire, Planck's constant, Refractive index of liquid / radius of curvature of Plano convex lens , Specific rotation of optical active substances, I-V characteristics of Semiconductor diode, Velocity of sound in air, Calculate R.T for specific hall/auditorium, Verify the expression for the resolving power of a telescope	Applying
CO2	Demonstrate Hartley and Colpitt's oscillator and simulation , Wavelength of light by Plane diffraction grating, Wavelength of light by He-Ne LASER	Applying

List of Experiments / Lab Activities.

List of Experiments/ Lab Activities- Any Eight Experiments

1	Find the diameter of the thin wire by diffraction of the 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 & Hartley Oscillator.
8	Determine the Planck's constant.
9	Study the I-V characteristic of semiconductor diode.
10	Newton's ring: Determination of wavelength of light and refractive index of liquid /radius of curvature of Plano convex lens
11	To calculate the reverberation time of specific hall.
12	Determination of Fermi energy of copper using a Wheatstone bridge.

Text Books

1	C. L. Arora *"Practical Physics"* S. Chand & Co Edition 2009.
2	P.R. Sasi Kumar *"Practical Physics"*, PHI Learning Pvt. Ltd 1st edition 2011.

References

1	Halliday, Resnic and Walker, *"Fundamentals of Physics"*, John Wiley, 9th edition 2011.
2	A. Beiser, *"Concepts of Modern Physics"*, McGraw Hill International, 5th edition, 2003.
3	Ajoy Ghatak, *"Optics"*, Tata McGraw Hill 5th edition, 2012.

Useful Links

1	https://nptel.ac.in/courses/115/105/115105121/
2	https://www.iitg.ac.in/cet/nptel.html
3	https://youtu.be/imHvRBOMg84

CO-PO Mapping For All B.Tech. Programs															
	Programme Outcomes (PO)												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	1													
CO2	2														
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															

Assessment (for Lab. Course)

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.

Assessment	Based on	Conducted by	Typical Schedule (for 26-week Sem)	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40

Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. 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.

Assessment Plan based on Bloom's Taxonomy Level

Bloom's Taxonomy Level	LA1	LA2	Lab ESE	Total
Remember	10	10	15	**35**
Understand	10	10	10	**30**
Apply	10	10	15	**35**
Analyze	0	0	0	**0**
Evaluate	0	0	0	**0**
Create	0	0	0	**0**
Total	**30**	**30**	**40**	**100**

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Course Information

Programme	B. Tech. (Electronics Engineering)
Class, Semester	First Year B. Tech. Sem .-II
Course Code	7HS101
Course Name	Communication & Generic skills
Desired Requisites:	10+2 level English

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

Course Objectives

1	Enable the students to communicate with clarity and precision.
2	Prepare the students to acquire structure of Oral and written eXpression required for their profession and enable them to acquire proper behavioural skills
3	Provide relevant knowledge about generic skills, its importance and enable them to understand personal attributes like commitment, loyalty, ethical values, team building, and ensure eXposure to personal growth.
4	Infuse the ability to positively consider other's views and to work effectively in teams and teach them self-management skills, problem solving skills and technological skills.

Course Outcomes (CO) with Bloom's Taxonomy Level

CO1	Communicate clearly, precisely and competently in different scenario	Apply
CO2	Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.	Understand
CO3	Practice Lifelong Learning (LLL) with positive attitude. loyalty, commitment, reliability, self-development and manage himself/herself physically, intellectually and psychologically.	Apply
CO4	Work ethically and effectively as a team member, manage tasks effectively and apply knowledge to solve problems.	Apply

Module	**Module Contents**	**Hours**
I	**Module 1: Introduction to communicative English** 1.Fundamentals 2. Elements 3.Process 4.Types 5.Barriers 6.Need to develop good interpersonal and intrapersonal skills 7.Developing effective Listening Skills (types, Barriers, listening and note making)	02
II	**Module2: Communicative Grammar & Developing advanced. Vocabulary.** 1.Modal verbs, non-modal verbs ,semi-modal verbs 2.Question tags 3.Misplaced Modifiers 4.Passives 5.Phrasal verbs **Vocabulary:** 1. Connectives, 2. Prefixes and suffixes, 3.Synonyms and Antonyms 4.one-word substitutions , 5.Re-arranging Jumbled sentences 6.redundancies	05

III	**Module 3 : Formal Communication Skills** **a. Oral skills:** Developing non-verbal skills. 1.Extempore /Public Speaking Skills (speeches) 2.Group Presentation 3.Individual Presentations **b. Written Skills**: 1.Paragraph Writing 2.Comprehension passage 3.Inter-office communication – Memorandums ,Circulars 4.Report Writing	05
IV	**Module 4: Introduction to Generic Skills** a. Importance of Generic Skill Development (GSD) b. Global and Local Scenario of GSD c. Lifelong Learning (LLL) and associated importance of GSD.	01
V	**Module 5: Self-management skills** **1. Knowing Self for Self-Development. (01 hrs)** a. Self-concept. b. Attitude, c. Self-esteem. d. Self-confidence. e. Self-motivation. **2 Personal Attributes (02 hrs)** a. Loyalty. b. Commitment. c. Honesty and integrity. d. Reliability. e. Enthusiasm. f. Balanced attitude while studying, working and home life. **3. Managing Self – Physical (02 hrs)** a. Personal grooming. b. Health, Hygiene. c. Time Management. **4. Managing Self – Psychological (02 hrs)** a. Stress, Emotions, Anxiety- concepts and significance. b. Exercises related to stress management. c. Techniques to manage the above.	07
VI	**Module 6: Teamwork Skills** **1. Team Building (01 hrs.)** Definition, hierarchy, team dynamics. **2. Team related skills. (02 hrs)** a. Sympathy, empathy. b. co-operation, concern, lead and negotiate. c. work well with people from culturally diverse background. **3. Technological Skills. (02 hrs.)** a. Task Initiation, Task Planning, Task eXecution, Task close out b. Exercises/case studies on task planning towards development of skills for task management. **4. Problem Solving skills. (02 hrs.)** a. Prerequisites of problem solving- meaningful learning, ability to apply knowledge in problem solving. b. Different approaches for problem solving. c. Steps followed in problem solving. d. Exercises/case studies on problem solving.	07

Text Books	
1	Textbook: Sanjay Kumar, Pushpalata, Communication Skills, Oxford University Press, First edition ,2012
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	Exercises in Spoken English, Parts 1 and II CIEFL, Hyderabad, Oxford University Press
Useful Links	
1	www.oupinheonline.com
2	www.scitechpublications.com

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

Assessment
The assessment is based on two In-semester evaluations (LA) of 30 marks each, one End-semester examination (ESE) of 40 marks. LA1 and LA2 are based on the modules taught (typically Module 1-3) and ESE is based on all modules with 30-40% weightage on modules before LA1 and 60-70% weightage on modules LA2.

Assessment Plan based on Bloom's Taxonomy Level				
Bloom's Taxonomy Level	**LA1**	**LA2**	**ESE**	**Total**
Remember				
Understand	10	10	10	**30**
Apply	20	20	30	**60**
Analyse				
Evaluate				
Create				
Total	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli

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Course Information

Programme	B.Tech. (All Branches)
Class, Semester	First Year B. Tech., Sem I/II
Course Code	7AM155
Course Name	Engineering Mechanics Lab
Desired Requisites:	Engineering Mechanics

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 hands on practice for the conduct of experiments to verify the principles of mechanics
2	To demonstrate the graphical methods to verify the analytical solutions

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Description
CO1	Demonstrate verification of laws and basic principles of mechanics through experiments.	III	Applying
CO2	Apply graphical method to solve problems on force system, beams, and frames.	III	Applying

List of Experiments / Lab Activities/Topics

List of Experiments :

1. Verification of law of triangle of forces
2. Verification of law of polygon of forces
3. Determination of support reactions for Simply Supported Beam
4. Verification of the principle of moments using Bell crank lever apparatus
5. Determination of the coefficient of friction for motion on horizontal plane
6. Determination of the coefficient of friction for motion on inclined plane
7. Analysis of concurrent and non-concurrent coplanar force system by graphical method
8. Analysis of statically determinate beams by graphical method
9. Analysis of pin jointed perfect plane frames by graphical method

Textbooks

1	Lab Manual Link - https://atifmohd077.files.wordpress.com/2019/03/em-lab-manual-1.pdf
2	Lab Manual Links - https://jecassam.ac.in/wp-content/uploads/2018/10/1_Engineering-Mechanics-Laboratory-2nd-SEM-DU-Old-Course.pdf
3	Bhavikatti., S. S. and Rajashekarappa., K. G. "Engineering Mechanics", New Age International Publishers, 2015, 5th Edition.

References

1	Ramamrutham., S. "Textbook of Applied Mechanics", Dhanpat Rai Publishing Company Limited, 2008.
2	Beer, F. P. and Johnston, E. R. "Vector Mechanics for Engineers Vol. I and II", McGraw Hill Company Publication, 2011, 9th Edition.
3	R. K. Bansal "Engineering Mechanics" Laxmi Publications ltd.

Useful Links	
1	https://nptel.ac.in/courses/112106286
2	https://www.youtube.com/watch?v=9Yt3I4bP-90
3	https://www.vlab.co.in/broad-area-civil-engineering
4	Virtual Lab link by IIT Mumbai - http://vlabs.iitb.ac.in/vlab/labsme.html

CO-PO Mapping

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

B. B Sawant

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Course Information

Programme	B. Tech. (Electronics Engineering)
Class, Semester	First Year B. Tech. SEM-II
Course Code	7CM156
Course Name	Civil & Mechanical Engineering Lab
Desired Requisites:	NA

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

Course Objectives

1	To provide a solid grounding in the fundamental principles and concepts of mechanical engineering, including mechanics, thermodynamics, materials science, and fluid mechanics
2	To introduce students to the field of mechanical engineering, its history, scope, and its importance in various industries.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	To understand mechanical testing and inspections, such as hardness testing, non-destructive testing (e.g., ultrasonic testing), and dimensional measurements.	II	Understand
CO2	To demonstrate experiments related to thermodynamics and heat transfer, such as measuring heat conduction through different materials or studying heat dissipation from electronic components.	II	Apply
CO3	Demonstrate identification and reading ability of elements in building drawing.	II	Understanding
CO4	Examine the material properties and comment on their quality.	III	Applying
CO5	Use surveying equipment to measure distance and area.	III	Applying

List of Experiments / Lab Activities

Mechanical:

1. Ultrasonic thickness measurements and flaw detection.
2. Liquid and magnetic particle testing for discontinuity examination.
3. Hardness measurements by using Rockwell, Brinell hardness testers.
4. Tensile test of metallic materials and study of Stress vs Strain curve.
5. Eddy current and acoustic emission flaw measurement techniques.
6. Use of machine learning and AI in mechanical testing. Only Demonstration.

Module Wise Measurable Students Learning Outcomes:

- Upon completion of this laboratory course, students will be able to understand the simple mechanical properties of materials.
- They will also get practical knowledge of the non-destructive testing.

List of Exercises:

1. Study and identify basic elements in
   i) Site plan,
   ii) Plan, elevation and section of a residential building
2. Study water supply and sanitation plan of a residential building
3. Field tests on brick
4. Field tests on Cement

5. Measurement of distance and area Demonstration of Total station	
Text Books [Mechanical]	
1	Raghuwanshi B. S.,"A Course in Workshop Technology I",Dhanpat Rai Publications,10th Ed.,2009
2	S. K. Hajra Choudhury and A. K. HajraChoudhary,"Workshop Technology" – Vol I [Manufacturing Processes]",Media Promoters and Publishers Pvt. Ltd., 10th edition, reprint 2001
3	Bawa . H S . "Workshop Practice, " McGraw Hill Education, Noida, 2nd edition ,2009 ISBN-13: 978-0070671195
4	Gupta, J. K . ; Khurmi , "A Textbook of Manufacturing Process" (Workshop Tech.) R S S Chand and Co., New Delhi,2020, ISBN:81-219-3092-8
5	Singh Rajender, "Introduction to Basic Manufacturing Process and Workshop Technology ",New Age International, New Delhi; 2014, ISBN: 978-81-224-3070-7
References [Mechanical]	
1	W.A.J. Chapman, "Workshop Technology Volume I", CBS Publishing & Distributors, Delhi. [ISBN-13:9788123904016] 2001
2	Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGraw Hill House,2017
3	Gowri P. Hariharan and A. Suresh Babu, "Manufacturing Technology – I" Pearson Education, 2008
Text Books [Civil]	
1	Hiraskar G. K., "Basic Civil Engineering", DhanpatRai publications, 1st Edition,2007
2	Gole L.G., "Introduction to Civil Engineering", Mahu Publisher House, 4th Edition, 2005
3	Bhavikatti S.S., "Basic Civil Engineering", New Age Publications, 2010
References [Civil]	
1	Duggal S.K., "Surveying (Vol I)", Tata McGraw Hill, 4th edition 2013
2	Bindra S.P., Arora S.P. , "Building Construction", DhanpatRai publication, 5th edition, 2012
Useful Links	
1	https://www.vlab.co.in/broad-area-mechanical-engineering

CO-PO Mapping For Electrical Engineering Department															
	Programme Outcomes (PO)												**PSO**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
CO1	3		1							1		1			
CO2	3		1												
CO3						2				1					
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															

CO-PO Mapping Electronics Engineering Department															
	Programme Outcomes (PO)												**PSO**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
CO1	3		1							1					
CO2	3		1												
CO3						2				1					
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															

CO-PO Mapping Computer Science and Engineering Department															
	Programme Outcomes (PO)												**PSO**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
CO1	3		1				3			1		1			
CO2	3		1				3								
CO3						2				1					
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															

CO-PO Mapping For Information Technology Department		
	Programme Outcomes (PO)	**PSO**

	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
CO1	3		1							1		1			
CO2	3		1												
CO3						2				1					
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.				
Assessment	**Based on**	**Conducted by**	**Typical Schedule (for 26-week Sem)**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40
Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. 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.				

Walchand College of Engineering, Sangli

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AY 2023-24

Course Information	
Programme	B. Tech. (Electronics Engineering)
Class, Semester	First Year B. Tech., Sem. -II
Course Code	7EN152
Course Name	Digital Electronics Lab
Desired Requisites:	Physics

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

Course Objectives	
1	To know about the logic gates
2	To build the logic circuit
3	

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	Understand the working of Digital IC	Understand
CO2	Able to build the Digital circuits	Analyze
CO3	Able to test the Circuits	Analyze

List of Experiments / Lab Activities/Topics

List of Topics(Applicable for Interaction mode):

1. Realization of logic gates using basic building block (NAND/NOR).

2. Implementation of combinational and sequential logic circuit.

Textbooks	
1	John F. Wakerly, *"Digital Design",* Pearson Education Publication, 5th edition, 2018.
2	Anand Kumar, "*Fundamentals of Digital Circuits*", PHI, 2nd Edition, 2009.
3	MandalS.K , "*Digital Electronics*" Mc-Graw-Hill, 1st Ediction., 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	12	1	2
CO1	2													
CO2														
CO3														
The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO, and preferably to only one PO.														

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

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2023-24

Course Information

Programme	B. Tech. (Electronics Engineering)
Class, Semester	First Year B. Tech. SEM-II
Course Code	7VS151
Course Name	Engineering Skills-I
Desired Requisites:	NA

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

Course Objectives

1	To train the students to use different tools and equipments involved in the manufacturing processes
2	To develop the skills to handle the basic cutting tools and devices required for various manufacturing processes, interpret the given job drawing, select relevant fitting tools
3	To prepare the students to carry out the various operations to make a finished product
4	To prepare approximate Estimate of material requirement in constructed structure and to calculate FSI

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	Illustrate the simple mechanical systems, machines, equipment, the basic working of cutting tools for manufacturing.	II	Understanding
CO2	Use of Fitting tools, job holding devices, measuring tools	III	Apply
CO3	Defining the building line out and masonry construction.	II	Understanding
CO4	calculate the FSI and terminologies related to building plan.	III	Apply
CO5	Estimate the material requirement in constructed structure.	II	Apply
CO6	Sketch building plan.	II	Apply

List of Experiments / Lab Activities

List of Experiments [Mechanical]:

1. Introduction to **woodworking**,the hand tools required and machines:
   Perform Planing operation,Cutting by chisel to prepare small **wooden job** [Square joint type] (4 Hrs)
2. Introduction to **fitting shop** tools, equipment/machines:
   Job consisting of **male and female parts** viz.one with groove, another with matching projection,holes on both and their assembly, as per given job drawing.
   operations to be performed:Marking,Punching,Sawcutting,Drilling, Edge filing operations (6 Hrs.)
3. Introduction to **sheet metal work** : Job of small **sheet metal tray** as per given job drawing with following operations: Marking,Cutting,bending/folding (4 Hrs.)

List of Experiments [Civil]:

1. Establishing verticality right angle corner level difference in masonry construction (2 Hrs)
2. Line out building plan on site (2 Hrs)
3. Estimate quantities/ material (4Hrs)
   a) Brickwork
   b) Concrete component
   c) Flooring
4. Sketching of building plan and calculation of FSI (2Hrs)

Text Books [Mechanical]

1	Raghuwanshi B. S.,"A Course in Workshop Technology I",Dhanpat Rai Publications,10th Ed.,2009
2	S. K. Hajra Choudhury and A. K. HajraChoudhary,"Workshop Technology" – Vol I [Manufacturing Processes]",Media Promoters and Publishers Pvt. Ltd., 10th edition, reprint 2001
3	Bawa . H S . "Workshop Practice, " McGraw Hill Education, Noida, 2nd edition ,2009 ISBN-13: 978-0070671195
4	Gupta, J. K . ; Khurmi , "A Textbook of Manufacturing Process" (Workshop Tech.) R S S Chand and Co., New Delhi,2020, ISBN:81-219-3092-8
5	Singh Rajender, "Introduction to Basic Manufacturing Process and Workshop Technology ",New Age International, New Delhi; 2014, ISBN: 978-81-224-3070-7
References [Mechanical]	
1	W.A.J. Chapman, "Workshop Technology Volume I", CBS Publishing & Distributors, Delhi. [ISBN-13:9788123904016] 2001
2	Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGraw Hill House,2017
3	Gowri P. Hariharan and A. Suresh Babu, "Manufacturing Technology – I" Pearson Education, 2008
Text Books [Civil]	
1.	Hirasakar G. K., "Basic Civil Engineering", DhanpatRai publications, 1st Edition,2007
2.	Gole L.G., "Introduction to Civil Engineering", Mahu Publisher House, 4th Edition, 2005
3.	Bhavikatti S.S., "Basic Civil Engineering", New Age Publications, 2010
References [Civil]	
1	Duggal S.K., "Surveying (Vol I)", Tata McGraw Hill, 4th edition 2013
2	Bindra S.P., Arora S.P. , "Building Construction", Dhanpat Rai publication, 5th edition, 2012
Useful Links	
1	https://www.vlab.co.in/broad-area-mechanical-engineering
2	https://drive.google.com/file/d/1tp5yV2ghp_Slub58S7iKnvvJyoEwQVYq/view
3	https://www.youtube.com/@workshop.supdtjmdabir5653
4	https://www.youtube.com/watch?v=gPaBULgRRuM
5	https://www.youtube.com/watch?v=-f7tTNRH_04
6	https://www.youtube.com/watch?v=UD3q5R0N8U4
7	https://www.youtube.com/watch?v=uapzeNwKq4U
8	https://www.youtube.com/watch?v=jbRgJbIGAwc
9	https://www.youtube.com/watch?v=TeErxz59Sss
10	https://www.youtube.com/watch?v=F4SwbJ1euB8
11	https://www.youtube.com/watch?v=cuv-tP6JHEI
12	https://www.youtube.com/watch?v=vUIY_BiLyFI
13	https://www.youtube.com/watch?v=xMQOR6Jg3o4
14	https://www.youtube.com/watch?v=OdrBpPNJMaI
15	https://www.youtube.com/watch?v=uAIXHqOm0AM
16	https://www.youtube.com/watch?v=DzCBASUKpF4
17	https://www.youtube.com/watch?v=TQ_NeHenT9Y
18	https://www.youtube.com/watch?v=rkp2Uvpop-g
19	https://www.youtube.com/watch?v=iDJ_sMvXsYs
20	https://www.youtube.com/watch?v=xZgtyNdGHvs

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

	Programme Outcomes (PO) Electrical												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1				1											
CO2				1											
CO3					1										
	Programme Outcomes (PO) Electronics												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1				1											
CO2				1											
CO3					1										
	Programme Outcomes (PO) Information Technology												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1				1											
CO2				1											
CO3					1										
	Programme Outcomes (PO) Computer Science and Engineering												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1				1											
CO2				1											
CO3					1										
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.				
Assessment	**Based on**	**Conducted by**	**Typical Schedule (for 26-week Sem)**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40
Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. 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.				

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AY 2023-24

Course Information

Programme	B.Tech. (Electrical & Electronics Engineering)
Class, Semester	First Year B. Tech., Sem I/ II
Course Code	7CH102
Course Name	Engineering Chemistry (Electrical / Electronics)
Desired Requisites:	Chemistry course at Secondary and Higher secondary level

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	0 Hrs/week	30	20	50	100
		Credits: 3			

Course Objectives

1	To make student familiar with engineering properties associated with different materials to use them successfully in practice.
2	To provide knowledge and significance of characterization and chemical analysis for using materials in different engineering applications.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Description
CO1	Explain terms chemical analysis, thermal analysis/ Batteries, fuel cell , water parameters, phase rule. Types of corrosion, Mechanism of Corrosion, water's industrial applications	II	Understanding
CO2	Draw schematic of water softeners, phase diagrams, Thermo grams/ Batteries, Fuel cell , Thermo equipment's, Glass electrode, GLC setup	II	Understanding
CO3	Classify types of chemical analysis, hard water, Chromatography. Corrosion, Batteries	II	Understanding
CO4	Calculate concentration of solutions, % of analyte gravimetrically, hardness of water, Calorific values, % weight loss TGA	III	Applying

Module	Module Contents	Hours
I	**Module 1. General principles of chemical Analysis Part A: Volumetry** Chemical analysis, Its types/ classification, Different ways to express concentration of solution & Numerical problems. Standards and its types, Definition of terms associated with titrimetry. Classification of titrimetry with application of type analysis, Numerical problems.	7
II	**Module 2. General principles of chemical Analysis Part B: Gravimetry & Instrument** Gravimetry and its requirements, applications and Numerical problems. pH metry, potentiometry, Single beam spectrophotometry w.r.t. Principle, Instrumentation, Calibration, Application Chromatography and its types & Introduction to GLC, Introduction for SEM, TEM,AFM and its applications. Advantages and Disadvantages of instrumental and non-instrumental methods.	6

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III	**Modules 3. Water Chemistry** - Natural sources of water, Impurities in natural water. Water quality parameters Hardness- Definition, Causes, Types, Expressing hardness, units to measure hardness, Numerical problems on hardness calculation, ill effects of hard water in steam generation, Alkalinity, Chloride , Dissolved oxygen(DO), Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) its significance. Ion exchange method of water softening	7
IV	**Module 4 : Corrosion Science** Definition of corrosion, Types of corrosion, Dry & wet corrosion, Electrochemical & Galvanic series & its importance, Mechanism of Hydrogen evolution and Oxygen absorption corrosion, Factors influencing rate of corrosion, Various methods for protection from corrosion viz. Surface coatings(Electroplating, Galvanizing, Tinning) Cathodic and Anodic protection,	7
V	**Module 5. Battery & Fuel cell:** Terms in battery and fuel cell: Anode, Cathode, Cell, Battery, Electrode Electrolyte, Types of batteries: Construction, working, uses and advantages of primary cells: Dry Cell: (Leclanche Cell) , Lithium cells: Lithium cells with solid cathode Lithium cells with liquid cathode, Secondary cell: Lead – Acid cell, Nickel – Cadmium Cell, Hydrogen oxygen fuel cell, Methyl Alcohol- Oxygen (Alkaline Fuel Cell)	6
VI	**Module 6- Phase Rule**: Gibbs phase rule, Explanation of the terms Phase, Component, Degree of freedom, Phase reactions, types of equilibrium, equilibrium conditions. One component system-Water system, Sulphur system, Two component system- Lead Silver system, Application of Eutectic system, Merit and Demerits of Phase rule.	6

	Textbooks
1	S.K. Singh, "Engineering Chemistry", New Age Publication, 3rd Edition , 2005.
2	Shasi Chawla, "Engineering Chemistry", Dhanpat Rai Publication, 3rd Edition , 2003.
3	Jain P.C. and Jain Monika, "Engineering Chemistry", Dhanpat Rai Publication, 16th Edition, 2013

	References
1	O G Palanna, "Engineering Chemistry" Tata McGraw Hill 2009.
2	Mendham, R.C. Denney, J.D. Barnes, M.J.K Thomas, "Quantitative Chemical analysis", Vogel's Pearson Education, 6th Edition , 2008.
3	S.S Dara, "Engineering Chemistry" S. Chand and Company 2008.
4	B Viswanathan M. Aulice Scibioh" Fuel Cell: Principle and Applications" Universities Press 2009
5	Askeland and Phule , "The Science and Engineering of Materials" Thomson Publication 4th Edition ,2003
6.	Douglas A. Skoog, E James Holler, Stanely R Crouch, " Principles of Instrumental Analysis", Thomson publication, 2007, 6th Edition

	Useful Links
1	https://edu.rsc.org/resources
2	A free resource for Chemistry teachers and students of all levels, including higher education, hosted by Royal Society of Chemistry.
3	https://www.digimat.in/nptel/courses/video/122106028/L01.html
4	https://onlinecourses.nptel.ac.in/noc21_cy49/preview

CO-PO Mapping														
	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	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, surprise or declared test etc. 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)

(Dr. Dodla S. Rao) Approved A. A. Powar (K. V. Mashale) (MB. V. B. Girgaonkar)