Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2023-24

Course Information	
Programme	B. Tech. (Mechanical Engineering)
Class, Semester	Third Year B. Tech., Sem. VI
Course Code	6ME321
Course Name	Machine Design
Desired Requisites:	

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	1 Hrs/week	30	20	50	100
		Credits: 4			

Course Objectives

1	To take overview of codes, standards and design guidelines for different machine elements and systems.
2	To explain the effect of different loading conditions on machine elements with safety factor.
3	To appraise the relationships between component level design and overall machine system design and performance.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Use theories of failure in design of various machine elements and systems.	III	Applying
CO2	Predict and calculate design parameters of machine elements and systems.	IV	Analysing
CO3	Test the performance of machine elements and systems subjected to different loading conditions.	V	Evaluate

Module	**Module Contents**	**Hours**
I	**Design of clutches and brakes** Uniform pressure and wear theory, types of clutches and brakes and its design	6
II	**Design of Belt and Chain Drives** Types of belts, maximum power transmission, selection from manufacturer's catalogue. Chain drives, polygonal effect, power rating	7
III	**Design of rolling contact bearing** Design and analysis of rolling contact bearings, selection of bearings from manufacturer's catalogue	7
IV	**Design of sliding contact bearing** Design and analysis of sliding contact bearings, hydrodynamic and hydrostatic bearings, Reynold's equation and numerical solutions using dimensionless parameter	6
V	**Design of Gears** Classification and selection of spur and helical gears, terminology, force analysis, design for maximum power transmission capacity, gear lubrication	7

VI	**Cylinders and pressure vessels** Thin and thick cylinders, Lame's equation, Clavarino's and Birnie's equation, Autofrettage	6
Textbooks		
1	V. B. Bhandari, "Design of Machine Elements", Tata McGraw Hill Publication, 3rd Edition, 2008	
2	J.F. Shigley, "Mechanical Engineering Design", McGraw Hill Publication, 8th Edition, 2008	
3	R. L. Norton, "Design of Machinery", McGraw Hill Publication, 3rd Edition, 2003	
References		
1	Timothy Wentzell, "Machine Design", Cengage Learning, 1st Edition, 2009	
2	M. F. Spotts, T.E Shoup, Hornberger, Jayaram, Venkatesh, "Design of Machine Elements", Pearson Education, 8th edition, 2011	
3	PSG Design Data Book, Third Edition, 1978	
Useful Links		
1	https://nptel.ac.in/courses/112/105/112105124/	

CO-PO Mapping

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

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

Assessment

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

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2023-24

Course Information

Programme	B. Tech. (Mechanical Engineering)
Class, Semester	Third Year B. Tech., Sem. VI
Course Code	6ME322
Course Name	Mechatronics and Automation
Desired Requisites:	

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

Course Objectives

1	Understand the mechatronic system, usage and advantages of mechatronics.
2	To understand the importance of automation in the of field machine tool based manufacturing.
3	To get the knowledge of various elements of manufacturing automation-CAD/CAM, sensors, pneumatics, hydraulics and CNC.

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 basic elements of mechanical, electrical, and control systems for automation and analyze them.	III	Applying
CO2	Employ use of mechatronic system, software's, controllers and optimization techniques for automation systems.	IV	Analysing
CO3	Verify automation systems knowledge into various modern applications	V	Evaluate

Module	**Module Contents**	**Hours**
I	**Introduction to Mechatronics** Origin, Scope, History, Evolution. Definition, Application of Mechatronics- Design and modelling, software integration, motion control, Vibration and noise control, microsystems, optics	6
II	**Sensors and Transducers** Role of measurement systems, Sensors in mechatronic systems, classification of sensors, Performance Terminology, Selection of sensors, Types of transducers, Displacement and position measurement, Inductive transducers, Capacitive transducers, piezoelectric transducers, Sensors for robotic systems, Photoelectric transducers, Flow sensors, Thermal transducers, SONAR, Other transducers	7
III	**Signal Conditioning and Controls** Signal generation, Transformers, Semiconductors, Signal manipulation and conversion, ADC and DAC. Relay and contactors. Microprocessor, Microcontroller, PLC, Arduino and Raspberry Pi controllers	7
IV	**Introduction to Automation** Why automation, current trends, Rigid automation Introduction, Mechanisation vs automation, Applications, Goals, Social issues, Low cost automation, Types, Reasons for automation, Issues, Ten strategies.	5

V	**NC and CNC** NC and NC part programming, CNC- adaptive control, automated material handling, assembly, flexible fixtures. **Computer Aided design** Fundamentals of CAD- Hardware in CAD- Computer graphics software and data base, Geometric modeling for downstream applications and analysis methods **Modeling and Simulation** Product design, process route modeling, optimization techniques, case studies and industrial applications	7
VI	**Robotics and automation** Introduction to robotics, mechanical and electro mechanical systems, pneumatics and hydraulics, Illustrative examples and case studies	7

Textbooks	
1	Mikell P. Groover, "Automation, Production systems and computer integrated manufacturing", Prentice Hall, 2007
2	Serope Kalpakjain and Steven R. Schmid, "Manufacturing Engineering and Technology", 7th edition, Pearson, 2013
3	Ibrahim Zeid, CAD/CAM : Theory & Practice, 2nd edition, 2006
4	R.K.Rajput - A textbook of mechatronics, - Education asia.

References	
1	YoramKoren, "Computer control of manufacturing system", McGraw Hill, 1st edition, 2017
2	Webb and Reis, "Programmable Logic Controller – Principles and Applications", Prentice Hall of India, 5th Edition, 2002
3	Kolk R.A. and Shetty Devdas, "Mechatronics System Design", Thomson Learning, 2007, 3rd Edition
4	Bolton - Mechatronics - Pearson Third edition

Useful Links	
1	https://nptel.ac.in/courses/112/103/112103293/
2	https://onlinecourses.nptel.ac.in/noc20_me58/preview
3	https://nptel.ac.in/courses/112/104/112104288/
4	https://nptel.ac.in/noc/courses/noc20/SEM2/noc20-me58/

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		1	2		1								2	
CO3	1			1	2	1							2	

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

Assessment

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

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2023-24

Course Information

Programme	B.Tech. (Mechanical Engineering)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	6ME323
Course Name	Computational Methods for Structures and Fluids
Desired Requisites:	

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

Course Objectives

1	To explain the general steps in finite element method.
2	To solve various field problems using finite element method.
3	To apply variational formulation method to solve mechanical engineering problems.
4	To use modern software to simulate structural, thermal and fluid problems.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Explain the use of mathematical modeling and FEM.	Apply
CO2	Use modern tools, software, and equipment's to analyze and solve the problems and interpret the data	Analyze
CO3	Analyze mechanical components, systems and projects required for industry by using FEM.	Evaluate

Module	**Module Contents**	**Hours**
I	**Introduction to FEM** Basic concepts of FEM – Historical background, relevance and scope for FEM – need for approximation, applications of FEM in various fields, advantages and limitations of FEM.	6
II	Introduction Discretization, interpolation, shape function, formulation of element characteristics matrices, assembly and solution.	7
III	Introduction, Geometrical approximations, Simplification through symmetry, Basic element shapes and behaviour, Choice of element type, Size and number of elements, Element shape and distortion, Location of nodes, Node and element numbering.	7
	Introduction to CFD	

I V	Philosophy of CFD, Governing equations of Fluid Dynamics, Presentations of Forms particularly suited for CFD, Mathematical behavior of PDEs	7
V	Basic Aspects of Discretization Finite Difference Method, Explicit Implicit approach, Errors and Stability analysis: A broader perspective, properties of discretization schemes, Solution techniques using FDM	6

V I	Finite Volume Method Introduction, FVM for one dimensional diffusion problem, steady state one dimensional convection diffusion problems, different schemes, assessment of different schemes.	7

Text Books	
1	S. S. Rao, "Finite Element Method in Engineering", Elsevier Publication, 4th Edition, 2004
2	P. Seshu, "Textbook of Finite Element Analysis",1st Edition. 2008.
	M. J Fagan, "Finite Element Analysis- Theory and Practice"; Longman Scientific & Technical, 1st Edition, 1992

References	
1	J. N. Reddy, "An Introduction to Finite Element Method", Tata McGraw Hill publication co. 2nd Edition, 1993
2	Logan D. L. "A first course in Finite Element Method", Cengage learning, 4th Edition, 2008.
3	O. C, Zienkiewicz "The Finite Element Method – Basic Concepts and Linear Applications", Tata McGraw Hill publication co., 5th Edition, 2000
4	Anderson, J.D., "*Computational Fluid Mechanics The Basics with applications", McGraw-Hill Publication 2013*
5	H.K.Versteeg and W Malalasekera, "Introduction to Computational Fluid Dynamics" 1995
6	Muralidhar K. and Sundararajan T., "*Computational Fluid Flow and Heat Transfer"*, Narosa Publishing House, 2nd edition, New Delhi 2011.
7	Subas V. Patankar*"Numerical heat transfer fluid flow",* Hemisphere Publishing Corporation, 1980.

Useful Links	
1	https://nptel.ac.in/courses/112/106/112106135/
2	https://nptel.ac.in/courses/112/104/112104115/

CO-PO Mapping

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

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

Assessment

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. (Mechanical Engineering)
Class, Semester	Third Year B. Tech., Sem. VI
Course Code	6ME371
Course Name	Computational methods for structures and fluids Lab
Desired Requisites:	

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

Course Objectives

1	To explain the finite element method, its fundamentals and general steps.
2	To describe the underlying theory, assumptions and modeling issues in FEM
3	To provide hands on experience using finite element software to model, analyze and design systems of mechanical engineering.
4	To provide hands on experience using finite element software to simulate structural, fluid and thermal problems.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Execute the structural, fluid, thermal and dynamic analysis using FEM software.	III	Understanding
CO2	Categorize the mathematical methods and finite element procedures for engineering applications.	IV	Analysing
CO3	Select the procedures for structural, thermal and fluid analysis of 1D, 2D and 3D problems.	V	Evaluating

List of Experiments / Lab Activities

List of Experiments:

Following practical's should be considered for ISE and ESE evaluation.

The students are expected to solve the problems by using any FEM software.

1. Analysis of stepped bar
2. Thermal and fluid analysis of composite wall
3. Torsional analysis of shaft
4. Analysis of truss
5. Problems on shape functions
6. Structural and fluid 2D analysis
7. Structural and fluid 3D analysis
8. Modal Analysis
9. Thermal and fluid 2D analysis
10. Thermal and fluid 3D analysis
11. Geometrical nonlinear analysis
12. Contact nonlinear analysis
13. Material nonlinear analysis
14. Industrial Visit to software company.

Text Books	
1	S. S. Rao, "*Finite Element Method in Engineering*", Elsevier Publication, 4th Edition, 2004
2	P. Seshu, "*Textbook of Finite Element Analysis",* 1st Edition, PHI publication, 2008.
3	M. J Fagan, "*Finite Element Analysis- Theory and Practice";* Longman Scientific & Technical, 1st Edition, 1992
References	
1	J. N. Reddy, "*An Introduction to Finite Element Method*", Tata McGraw Hill publication co. 2nd Edition, 1993
2	Logan D. L. "*A first course in Finite Element Method*", Cengage learning, 4th Edition, 2008.
3	O. C, Zienkiewicz *"The Finite Element Method – Basic Concepts and Linear Applications*", Tata McGraw Hill publication co., 4th Edition.
Useful Links	
1	https://www.udemy.com/course/ansys-mechanical-apdl-for-finite-element-simulation
2	https://www.youtube.com/watch?v=qx69C-UyxsE&list=PLtt6-ZgUFmMKFfbOBhmCwG30KIVyvhDop

CO-PO Mapping														
	Programme Outcomes (PO)												PSO	
	a	b	c	d	e	f	g	h	i	j	k	l	1	2
CO1		2		3				3						
CO2		2		2				2						
CO3		2	2									1		
The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO, and preferably to only one PO.														

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

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2023-24

Course Information

Programme	B.Tech. (Mechanical Engineering)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	6ME342
Course Name	Mini Project 2
Desired Requisites:	

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	2 Hrs./Week	**LA1**	**LA2**	**Lab ESE**	**Total**
Interaction	-	30	30	40	100
		Credits: 01			

Course Objectives

1	To familiarize students with the concept of project based learning.
2	To give hands-on experience to students on developing problem statement and methodology to attempt solving such problems.
3	To learn the technical report writing skills.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Conceive a problem statement either from rigorous literature survey or from the requirements raised from need analysis.	II	Understanding
CO2	Design, and develop the model / prototype / algorithm in order to solve the conceived problem.	III	Illustrating
CO3	Write comprehensive report on mini project work	V	Organising

Course contents

Guidelines:

1. The mini-project is a team activity having 3-4 students in a team.

2. Mini project should include mainly Mechanical Engineering contents but can be multi disciplinary too.

2. The mini project may be a complete hardware or a combination of hardware and software. The software part in mini project should be less than 50% of the total work.

3. Mini Project should cater to a small system required in laboratory or real life.

4. It should encompass components, devices etc. with which functional familiarity is introduced.

5. After interactions with course coordinator and based on comprehensive literature survey/ need analysis, the student shall identify the title and define the aim and objectives of mini-project.

6. Student is expected to detail out specifications, methodology, resources required, critical issues

involved in design and implementation and submit the proposal within first week of the semester.

7. The student is expected to exert on design, development and testing of the proposed work as per the schedule.

8. Completed mini project and documentation in the form of mini project report is to be submitted at the end of semester.

Guidelines for Assessment of Mini Project Practical / Oral Examination:
Report should be prepared as per the guidelines issued by the department.
Mini Project shall be assessed through a presentation and demonstration by the student project group to faculty advisor / a panel of examiners.
Students shall be motivated to publish a paper based on the work in students competitions / Conferences / journals.

1. Mini Project shall be assessed based on following points;
2. Quality of problem and clarity
3. Proper use of knowledge and practices of mechanical and or other engineering disciplines.
4. Effective use of skill sets
5. Contribution of an individual's as member or leader
6. Clarity in written and oral communication

Text Books	
1 ●	
2	
References	
1	Meredith, Jack R., and Samuel J. Mantel Jr. Project management: a managerial approach. John Wiley & Sons, 2011.
2	K. T. Ulrich, S. D. Eppinger, and M. C. Yang , Product Design & Development, , 7th Edition, McGraw Hill, 2019.
3	M. Mahajan, Industrial Engineering and Production Management, 1st Edition, DhanpatRai & Co. (P) Limited, 2015.
4	V. Balachandran and Chandrasekaran, Corporate Governance, Ethics and Social Responsibility, PHI, 2nd Edition, 2011
Useful Links	
1	
2	

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

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2023-24

Course Information	
Programme	B. Tech. (Mechanical Engineering)
Class, Semester	Third Year B. Tech., Sem. VI
Course Code	6ME331
Course Name	Energy Conservation and Management
Desired Requisites:	

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

Course Objectives	
1	To introduce energy and power scenario, electrical systems, energy auditing, energy conservation and energy impact on environment.
2	To provide knowledge of energy management, energy auditing and energy conservation.
3	To develop skill to carry out energy audit and to suggest methodologies for energy savings.
4	To prepare the students for higher studies and research in the field of energy conservation and management.

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 energy and power scenario, electrical systems, energy auditing, energy conservation and energy impact on environment.	III	Applying
CO2	Carryout energy accounting and balancing.	IV	Analysing
CO3	Exercise energy audit and suggest methodologies for energy savings.	V	Evaluate

Module	**Module Contents**	**Hours**
I	**Introduction** Introduction to energy and power scenario of world; national energy consumption data, environmental aspects associated with energy utilization, energy auditing - need, types, methodology and barriers, role of energy managers, instruments for energy auditing	3
II	**Electrical Systems** Components of EB billing, HT and LT supply, transformers, cable sizing, concept of capacitors, power factor improvement, harmonics, electric motors – motor efficiency computation, energy efficient motors, Illumination – Lux, Lumens, types of lighting, efficacy, LED lighting and scope of energy conservation in lighting	5
III	**Energy Management and Audit** Definition, energy audit, need, types of energy audit. Energy management (audit) approach-understanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel and energy substitution, energy audit instruments and metering	5

IV	**Thermal Systems** Thermal systems, boilers, furnaces and thermic fluid heaters- efficiency computation and energy conservation measures; steam distribution and usage, steam traps, condensate recovery, flash steam utilization; insulation & refractories	4
V	**Energy Conservation in major utilities** Energy conservation in major utilities, pumps, fans, blowers, compressed air systems, refrigeration& air conditioning systems, cooling towers, dg sets. energy economics- discount period, payback period, internal rate of return, net present value; life cycle costing- ESCO concept	5
VI	**Energy and environment, air pollution, climate change** United nations framework convention on climate change (UNFCC), sustainable development, Kyoto Protocol, Conference of Parties (COP), clean Development Mechanism (CDM), Prototype Carbon Fund (PCF)	4

Textbooks	
1	Witte L.C. Schmidt P.S. and Brown D.R., "Industrial Energy Management and Utilization", Hemisphere Publ., Washington, 1988
2	Callaghn P.W., "Design and Management for Energy Conservation", Pergamon Press, Oxford, 1981
3	Murphy W.R. and McKay G., "Energy Management", Butterworths, London, 2003
4	Energy Manager Training Manual, Bureau of Energy Efficiency (BEE) under Ministry of Power, GOI, 2008 (available at www.energymanager training.com)

References	
1	Recent reports of agencies: International Energy Agency (IEA), Ministry of New and Renewable energy (MNRE), Technology and Action for Rural Advancement (TARA)
2	Dale R Patrick, Stephen W Fardo, "Energy Conservation Guidebook", 2nd Edition, CRC Press
3	Albert Thumann, "Handbook of Energy Audits", 6th Edition, The Fairmont Press
4	Bureau of Energy Efficiency Reference book: No.1, 2, 3 4

Useful Links	
1	http://nptel.iitm.ac.in/
2	www.bee.com
3	www.powermin.nic.in

CO-PO Mapping

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

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

Assessment

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

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2023-24

Course Information	
Programme	B. Tech. (Mechanical Engineering)
Class, Semester	Third Year B. Tech., Sem. VI
Course Code	6ME332
Course Name	Power Plant Engineering
Desired Requisites:	

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

Course Objectives	
1	To introduces the students about different power plants, energy audit and economics.
2	To prepare the students to analyze the power plants and its various parameters.
3	To develop the skill to select, analyze the power plant system and allied parameters
4	

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 energy harvesting from water, fuels like coal, nuclear, diesel and hydrocarbon	III	Applying
CO2	Distinguish and interpret the parameters related to power plants.	IV	Analysing
CO3	Select the appropriate system, instruments and allied parameters based on performance, energy consumption and economics.	V	Evaluate

Module	**Module Contents**	**Hours**
I	**Introduction** Energy resources and their availability, types of power plants, selection of the plants, review of basic thermodynamic cycles used in power plants	4
II	**Hydro-Electric Power Plants** Rainfall and run-off measurements and plotting of various curves for estimating stream flow and size of reservoir, power plants design, construction and operation of different components of hydro-electric power plants, site selection, comparison with other types of power plants	5
III	**Steam Power Plants** Flow sheet and working of modern-thermal power plants, super critical pressure steam stations, site selection, coal storage, preparation, coal handling systems, feeding and burning of pulverized fuel, ash handling systems, dust collection-mechanical dust collector and electrostatic precipitator	5
IV	**Other Power Plants** Basic principles and types of diesel plants, advantages and disadvantages of diesel plants ,operation performance of a diesel engine, construction and working principles of gas turbine power plants, basic components and auxiliary systems used in gas turbine power plants, different types of fuels and materials used in gas turbine power plants. Principles of nuclear energy, basic nuclear reactions, nuclear reactors-PWR, BWR, advantages and limitations	5

V	**Power Plant Instrumentation and Energy Audit** Steam pressure and steam temperature measurement, flow measurement of feed water, fuel, air and steam with correction factor for temperature, speed measurement, level recorders, smoke density measurement, dust monitor, flue gas oxygen analyzer – analysis of impurities in feed water and steam, dissolved oxygen analyzer, ph meter-fuel analyzer, and pollution monitoring instruments, current simple methods of energy auditing	4
VI	**Power Plant Economics** Load curve, different terms and definitions, cost of electrical energy, tariffs methods of electrical energy, performance & operating characteristics of power plants- incremental rate theory, input-output curves, efficiency, heat rate, economic load sharing and simple numerical	4

Textbooks	
1	EL-Wakil, "Power plant Technology", M.M., McGraw Hill, 1st Edition, 2017
2	P.K. Nag , "Power Plant Engineering", Tata McGraw Hill,4th Edition 2017
3	Domkundwar, Arora, "Power plant Technology", Dhanpat Rai and Co. sixth edition 2013

References	
1	Weisman, J., and Eckert, L., "Modem Power Plant Engineering", Prentice Hall, 1st edition. 1999.
2	Kam W. Li and A. Paul Priddy, "Power Plant System Design", John Wiley, 1st edition, 2018.
3	Recent reports of agencies: International Energy Agency (IEA), Ministry of New and Renewable energy (MNRE), Technology and Action for Rural Advancement (TARA)

Useful Links	
1	NPTEL Course on POWER PLANT ENGINEERING, Department of Mechanical Engineering IIT Roorkee - https://nptel.ac.in/courses/112/107/112107291/
2	Course on Power Plant Engg., IIT Kharagpur, https://youtube.com/playlist?list=PLwOhSTeCfDgmA7LFqMnT0yb83dmr9esWZ

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	2	2		1								2	2

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

Assessment

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

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2023-24

Course Information

Programme	B. Tech. (Mechanical Engineering)
Class, Semester	Third Year B. Tech., Sem. VI
Course Code	6ME333
Course Name	Operations Research
Desired Requisites:	

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

Course Objectives

1	To enable the students to formulate and solve linear programming problems.
2	To prepare the students to use mathematical models for solving optimization problems.
3	To train the students to analyze real-world problems in view of finding optimal 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	Solve linear programming problems.	III	Applying
CO2	Formulate mathematical models for real life cases.	IV	Analysing
CO3	Select models for optimization under different constraints.	V	Evaluate

Module	**Module Contents**	**Hours**
I	**Linear programming problem** Formulation of linear programming problem, graphical solution method, simplex method.	5
II	**Duality concept and integer programming** Duality concept, dual simplex method for LPP, Gomery's cutting plane method for integer programming problem	4
III	**Transportation models** Mathematical formulation, methods to obtain initial basic feasible solution, conditions for testing optimality, MODI method for testing optimality solution of balanced and unbalanced problems, degeneracy and its resolution.	5
IV	**Assignment models** Mathematical formulation, balanced and unbalanced assignment problems, maximization problems, assignment with restrictions, traveling salesman problem	4
V	**Game theory** Games theory: introduction, minimax and maximin principle, solution of zero sum two persons games, saddle point, algebraic method, dominance properties, graphical method	4
VI	**Replacement model** Replacement model for items whose maintenance cost increases with time (money value constant) and with change in money value, selection of best machine, replacement of items that fail suddenly, individual and group replacement policies.	4

Textbooks

1	Hira D.S. and Premkumar Gupta, "Operation Research", S. Chand and Co. Ltd., Revised Edition, 2008
2	Sharma J.K., "Operations Research: Theory and Applications", Macmillan publishers India Ltd., 4th Edition, 2009
3	Sharma S. D., "Operation Research", Kedarnath and Rannath & Co, 5th Edition, 2005
References	
1	R. Panneerselvam, "Operations Research", Prentice Hall India Pvt. Ltd., 2004
2	Vohra N.D., "Quantitative Techniques in Management", McGraw Hill, 4th Edition, 2010
3	Mahajan Manohar, "Operations Research", Dhanpat Rai and Company Pvt. Ltd., 1st Edition 2006
Useful Links	
1	https://www.youtube.com/watch?v=a2QgdDk4Xjw&list=PLjc8ejfjpgTf0LaDEHgLB3gCHZYcNtsoX

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

Assessment
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. (Mechanical Engineering)
Class, Semester	Third Year B. Tech., Sem. VI
Course Code	6ME334
Course Name	Design and Optimization of Mechanical Elements
Desired Requisites:	

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

Course Objectives

1	To design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, ethical, health and safety, manufacturability, and sustainability.
2	To use the optimization techniques and tools for necessary engineering practice.
3	To use mathematical methods and computers to make rational decisions in solving a variety of optimization problems.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Implement different methods for optimum design	III	Applying
CO2	Analyze different optimization techniques.	IV	Analysing
CO3	Evaluate and interpret solution of an optimization problem.	V	Evaluate

Module	**Module Contents**	**Hours**
I	**Introduction** Introduction to Design- The design Process, Conventional versus Optimum design process, optimum design versus optimal control Optimum design problem formulation- The problem formulation process with examples, A general mathematical model for optimum design	4
II	**Optimum design Concepts** Definitions of global and local minima, review of some basic calculus concepts, Unconstrained and constrained Optimum design problems, postoptimality analysis: Physical meaning of Langrange Multipliers, Global Optimality, Engineering design examples	5
III	**Graphical Optimization** Graphical solution process, Use of mathematica for graphical optimization, Design problem with multiple solutions, problem with Unbounded solution, Infeasible problem, Graphical solution for different application.	5
IV	**Linear Programming Methods for Optimum Design** Definition of a standard linear programming problem, Basic concepts related to linear programming problems, Basic ideas and steps of the Simplex method, Two phase simplex method	4
V	**Numerical Methods for Unconstrained Optimum Design** General concepts related to Numerical algorithms, basic ideas and algorithms for step size determination, search direction determination: steepest descent method, conjugate gradient method	4

VI	**Numerical Methods for Constrained Optimum Design** Basic Concepts and Ideas, Linearization of constrained problem, sequential linear programming algorithm, Quadratic programming sub problem, Constrained steepest descent method	4

Textbooks	
1	Jasbir. Arora , Introduction to optimum Design, Elsevier, 4th edition
2	Johnson Ray, C., "Optimum design of mechanical elements", Wiley , John & Sons, 1981.
3	Singeresu S. Rao, "Engineering Optimization - Theory and Practice" New Age Intl. Ltd., Publishers, 2000.
References	
1	Kalyanamoy Deb, "Optimization for Engineering design algorithms and Examples", PHI India,199
2	Goldberg, D.E., "Genetic algorithms in search, optimization and machine", Barnen, Addison-Wesley, NewYork, 1989
3	PSG Design Data Book, Third Edition, 1978
Useful Links	
1	https://www.youtube.com/watch?v=LL20TZGXp3Q

CO-PO Mapping

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

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2023-24

Course Information

Programme	B. Tech. (Mechanical Engineering)
Class, Semester	Third Year B. Tech., Sem. VI
Course Code	6ME372
Course Name	Mechatronics Systems Lab
Desired Requisites:	

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

Course Objectives

1	To revise basic electronic/electrical concepts and understand use of basic electronics components like diodes, transistors etc. and their use in amplification and switching.
2	To Demonstrate use of sensors and their integration with microcontroller and PLC and use of microcontroller for doing various tasks.
3	To make students familiar with various modern and advanced control tools.

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	Select appropriate electrical/ electronic components like diodes, transistors etc. to form meaningful circuits.	III	Applying
CO2	Analyze logic for operating a particular system by using a PLC or a microcontroller	IV	Analysing
CO3	Summarize the requirements of process elements and equipment's available in modern era	V	Evaluating

List of Experiments / Lab Activities

Term work shall contain experiments from following list:

1. Demonstration and development based on Relay logic control
2. PLC based Ladder logic programming
3. Traffic control system for three road crossing.
4. Traffic control system for four road crossing
5. Traffic control system for six road crossing
6. Programming and controlling for lift/ elevator system.
7. Programming and controlling for coin counter systems.
8. Demonstration and use of star delta starter.
9. Programming and controlling for HMI.
10. Programming and controlling for Vending machine operation.

Text Books

1	Gaonkar, "Introduction of 8085", Penram International Publishing (I) Pvt. Ltd, 2002.
2	Hackworth J.and Hackworth D. It, "Programmable Logic Controller — Programming Methods and Applications", Pearson Education, 2006.

References	
1	“Manufacturer’s Manuals for different PLC Systems”.
2	Gary Dumming, “Introduction to PLC”, Delmar Publication
Useful Links	
1	https://www.youtube.com/watch?v=J89K1x7b6Ec&list=PLg0bf3Cfp1mwNBrZ-oERNOAVU_iMpaclW

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		1	2										2	
CO3			2											
The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO, and preferably to only one PO.														

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

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2023-24

Course Information	
Programme	B. Tech. (Mechanical Engineering)
Class, Semester	Third Year B. Tech., Sem. VI
Course Code	6ME373
Course Name	Automation Lab
Desired Requisites:	

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

Course Objectives	
1	To study various applications of automated systems for improving the productivity of the manufacturing industry.
2	To demonstrate effective use of various microprocessors, microcontrollers, PLC and other modern control systems for various applications.
3	To develop student's ability to demonstrate different control systems

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Apply knowledge to make simple automated system for industrial use to pick and place applications, welding, painting etc.	III	Applying
CO2	Analyse logic for operating particular system using higher end control system	IV	Analysing
CO3	Create independent small application oriented PLC based design	VI	Create

List of Experiments / Lab Activities/Topics

List of Lab Activities:

1. Automated bottle filling plant
2. Automatic object detection and identification
3. PLC based motor and actuator control
4. Programming and controlling of automated fluid mixer system
5. Programming and controlling for spot welding mechanism
6. Programming and controlling for spray painting
7. PLC based control of various sensor interface
8. Programming and controlling for pick and place
9. Programming and controlling for annunciator

Automation based analysis on case study in specific manufacturing domain

Textbooks	
1	R Thomas Wright, "Manufacturing and Automation Technology", Tata Mc Hill, 2002.
2	Serope Kalpakjain and Steven R. Schmid, "Manufacturing Engineering and Technology", 7th edition, Pearson, 2013.

References	
1	"Manufacturer's Manuals for different PLC Systems".
2	Gary Dumming, "Introduction to PLC", Delmar Publication

Useful Links	
1	https://www.youtube.com/watch?v=J89K1x7b6Ec&list=PLg0bf3Cfp1mwNBrZ-oERNOAVU_iMpaclW
2	https://nptel.ac.in/courses/112/103/112103293/

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

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

Assessment

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

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

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

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2023-24

Course Information

Programme	B. Tech. (Mechanical Engineering)
Class, Semester	Third Year B. Tech., Sem. VI
Course Code	6ME374
Course Name	Industrial Hydraulics and Pneumatics Lab
Desired Requisites:	

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

Course Objectives

1	To develop an interest in oil hydraulic and pneumatic systems.
2	To prepare the students to select an appropriate system for an industrial problem with due reference to the advantages, limitations, cost, economy, etc.
3	To design a hydraulic and pneumatic system for various 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	Operate and control the hydraulic and pneumatic systems.	III	Applying
CO2	Analyse different components and circuits of hydraulic and pneumatic systems.	IV	Analysing
CO3	Design and build hydraulic and pneumatic circuits for automation.	VI	Creating

List of Experiments / Lab Activities

Laboratory work shall contain any 8 experiments from following list :

1. Experiments on hydraulic trainer kit with following circuits
   a. Basic hydraulic circuit for linear and rotary motion.
   b. Regenerative circuit
   c. Traverse and feed circuit
   d. Meter-in, meter-out and bleed-off circuit.
   e. Sequencing circuit with sequence valve
   f. Synchronization motion of cylinders.
2. Experiments on pneumatic trainer kit with following circuits
   a. Pneumatic circuits for linear and rotary motion
   b. Sequencing circuit of type A+ B+ A—B—
   c. Sequencing circuit for A+ B+ B— A—
   d. Sequencing of cylinders with electric and electronic control

Text Books

1	S R. Majumdar, "Oil Hydraulic Systems-Principles and Maintenance ", Tata McGraw-Hill, New-Delhi, 2006
2	S.R. Majumdar, "Pneumatic Systems: Principles and Maintenance", Tata McGraw-Hill, New-

	Delhi, 2006
References	
1	D.A. Pease, “Basic Fluid Power”, Prentice Hall Ltd., 1988
2	J.J. Pipenger, “Industrial Hydraulics”. McGraw-Hill Publications, 1979
3	Goodwin, “Power Hydraulics
Useful Links	
1	https://www.youtube.com/watch?v=dxAsr14DW6Y&list=PLbMVogVj5nJTKwm1WjlutrAEZrLE995Ja

CO-PO Mapping														
	Programme Outcomes (PO)												**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	1		3											
CO2		3	3									1	2	
CO3		3	1	1										
CO4														
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. (Mechanical Engineering)
Class, Semester	Third Year B. Tech., Sem. V
Course Code	6ME375
Course Name	Mechanical Measurement and Control Lab
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	Students will be able to use various experimental techniques relevant to the subject.
2	Students will acquire hands on experience on the various test-rigs, Experimental setup.
3	Students will be able to function as a team member

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Measure various mechanical quantities.	V	Evaluating
CO2	Calibrate various mechanical measuring instruments	IV	Analysing
CO3	Compare different measurement techniques.	IV	Analysing

List of Experiments / Lab Activities

List of Experiments

1. Calibration of Bourdon Tube Pressure Gauge.
2. Speed measurement.
3. Strain measurement using resistance strain gauge.
4. Displacement measurement by using LVDT.
5. Vacuum measurement.
6. Calibration of Rota meter for fluid flow measurement.
7. Force measurement using dynamometer.
8. Measurement of the vibration parameters of a rotary machine.
9. Noise measurement and addition /subtraction of noise levels.
10. Measurement of the torque.
11. Calibration of thermocouple and measurement of the temperature using various temperature sensors.

Text Books

1	Kumar D.S., Mechanical Measurement and Control, Metropolitan Book Co. Pvt. Ltd., New Delhi, 4th Edition, 2007.
2	Beckwith and Buck, Mechanical Measurement, Pearson Education Asia, 5th Edition, 2001.
3	Rao S. S., Mechanical Vibrations, Pearson education, 5th edition, 2010

References

1	Doebel in Emesto, Measurement Systems, McGraw Hill International Publication Co. New York, 4th Edition,1990
2	Rettinger Michael, Acoustic Design and Noise Control, Vol. I &II, Chemical Publishing Co. New York, 1st edition, 19

Useful Links	
1	http://mdmv-nitk.vlabs.ac.in/
2	http://va-coep.vlabs.ac.in/
3	https://sm-nitk.vlabs.ac.in/

CO-PO Mapping

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

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

Assessment

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

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

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