JSS MAHAVIDYAPEETHA

JSS SCIENCE AND TECHNOLOGY UNIVERSITY, MYSURU

SRI JAYACHAMARAJENDRA COLLEGE OF ENGINEERING, MYSURU

M.TECH PROGRAMME IN
MAINTENANCE ENGINEERING

SCHEME I TO IV SEMESTER: 2017-2018
&
SYLLABUS I TO IV SEMESTER: 2017-2018

DEPARTMENT OF MECHANICAL ENGINEERING

Scheme of Teaching and Examination for M.Tech (MMT)

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JSS SCIENCE AND TECHNOLOGY UNIVERSITY, MYSURU

SRI JAYACHAMARAJENDRA COLLEGE OF ENGINEERING, MYSURU

DEPARTMENT OF MECHANICAL ENGINEERING

Scheme of Teaching and Examination for M.Tech (MMT)

SEMESTER	CREDITS
I	28
II	28
III	18
IV	26
TOTAL	100

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DEPARTMENT OF MECHANICAL ENGINEERING

Scheme of Teaching and Examination for M.Tech (MMT)

SEMESTER I:

Sl. No.	Subject code	Course Name	Credits				Contact Hours Per Week	Marks		Total	Exam Duration in Hrs.
			L	T	P	Total		CIE	SEE		
1	MMT110	Maintenance Engineering	4	1	0	5	6	50	50	100	3
2	MMT120	Tribology and Bearing Design	4	0	1	5	6	50	50	100	3
3	MMT130	Advanced theory of Vibrations	4	0	1	5	6	50	50	100	3
4	MMT14X	Elective-I	4	1	0	5	6	50	50	100	3
5	MMT15X	Elective-II	4	1	0	5	6	50	50	100	3
6	MMT 16L	Non Destructive Testing Lab	0	0	1.5	1.5	3	50	-	50	-
7	MMT170	General Seminar	-	-	-	1.5	3	50	-	50	-
TOTAL						28	36			600	

Elective-I	
MMT141	Quality and Reliability Engineering
MMT142	Operations, Maintenance of Hydraulic and Pneumatic systems
MMT143	Advanced Topics in Metal Joining
Elective-II	
MMT151	Non Destructive Testing
MMT152	Surface Treatment and Finishing
MMT153	Computers in Maintenance Engineering

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DEPARTMENT OF MECHANICAL ENGINEERING

Scheme of Teaching and Examination for M.Tech (MMT)

SEMESTER II:

Sl. No.	Subject code	Course Name	Credits				Contact Hours Per Week	Marks		Total	Exam Duration in Hrs.
			L	T	P	Total		CIE	SEE		
1	MMT210	Failure Mechanism and Analysis	4	0	1	5	6	50	50	100	3
2	MMT220	Maintenance of Machinery	4	0	1	5	6	50	50	100	3
3	MMT230	Condition Based	4	0	1	5	6	50	50	100	3
4	MMT24X	Elective-I	4	1	0	5	6	50	50	100	3
5	MMT25X	Elective-II	4	1	0	5	6	50	50	100	3
6	MMT26L	Dynamics Lab	0	0	1.5	1.5	3	50	-	50	-
7	MMT270	General Seminar	-	-	-	1.5	3	50	-	50	-
TOTAL						28	36			600	

Elective-I	
MMT241	Noise Measurement Analysis & Control.
MMT242	Rotor Dynamics.
MMT243	Maintainability.
Elective-II	
MMT251	Value Engineering.
MMT252	Plant Engineering.
MMT253	Repair Technology.

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DEPARTMENT OF MECHANICAL ENGINEERING

Scheme of Teaching and Examination for M.Tech (MMT)

SEMESTER III

Sl. No.	Subject Code	Course Name	Credits				Contact Hours Per week	Marks		Total	Exam Duration in Hrs
			L	T	P	Total		CIE	SEE		
1	MMT310	Practical Training in Industry/ Exploration Research	0	0	4	4	8 Weeks Duration	100	-	100	-
2	MMT320	Project Work (Phase I)	0	0	14	14		100	-	100	-
Total Credits						18		Total Marks		200	

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DEPARTMENT OF MECHANICAL ENGINEERING

Scheme of Teaching and Examination for M.Tech (MMT)

SEMESTER IV

Sl. No.	Subject Code	Course Name	Credits				Contact Hours Per week	Marks		Total	Exam Duration in Hrs
			L	T	P	Total		CIE	SEE		
1	MMT410	Project Work (Phase II)	0	0	26	26	--	100	200	300	3
Total Credits						**26**		**Total Marks**		**300**	

Department: **Mechanical Engineering, SJCE, Mysuru**

Subject Name & Code	**MAINTENANCE ENGINEERING MANAGEMENT MMT110**
No. of Teaching Hours – 52 + 26	**Credits : 4:1:0 L-T-P**
CIE Marks: 50	**SEE Marks: 100**

Course objectives:

1. To apply knowledge of maintenance engineering management fundamentals to the defined procedures, processes, systems and/or methodologies.
2. To apply and analyze broadly defined maintenance problems and solve them using mathematical and analytical tools.
3. To solve specific problems through standard codes and practices, provide solutions through validated inferences and authenticated documents.
4. To describe functions and responsibilities of a member and a leader, strength of team work in diverse challenges related to engineering and technology areas.

Course outcomes:

At the end of the course the students shall have the abilities to:

CO1	Apply knowledge of maintenance engineering management fundamentals to the defined procedures, processes, systems and/or methodologies.	PO1, PO2, PO3, PO4, PO5, PO6, PO9, PSO1, PSO2, PSO3
CO2	Identify and analyze broadly defined maintenance problems and reach out to substantial solutions through mathematical and analytical tools using maintenance engineering management principles and practices.	PO1, PO2, PO3, PO4, PO5, PO6, PO9, PSO1, PSO2, PSO3
CO3	Investigate specific problems through relevant standard codes and practices and provide solutions through validated inferences and authenticated documents.	PO1, PO2, PO3, PO4, PO5, PO6, PO9, PSO1,

CO4	Acquaint with the functions and responsibilities of role of an individual as a member and also as a leader and understand the coherent strength of team work in diverse challenges related to	PO1, PO2, PO3, PO4, PO5, PO6, PO9, PSO1,
CO5	Present the findings of the maintenance solutions arrived at, using proper charts, tables and presentation techniques.	PO1, PO2, PO3, PO4, PO5, PO6, PO9, PSO1,

Course Content

UNIT- 1

Introduction: Objectives and Functions of maintenance. Factors influencing plant availability, Maintenance control, Maintenance Strategies, Organization for Maintenance. Failure Statistics: Breakdown time distributions, Poisson, Exponential and Normal Distributions, Failure Probability, Survival Probability and age specific failure rates. **15 Hrs**

UNIT- 2

Maintenance Planning: Establishing maintenance plan and schedule, illustrative examples, Overhaul and Repair: Meaning and difference, optimal overhaul / Repair / Replace maintenance policy for equipment subject to breakdown. Replacement Decisions: Deterministic and stochastic replacement situations, failure and preventive replacement, Optimal Interval between preventive replacement of equipment subject to breakdown, group replacement. **15 Hrs**

UNIT-3

Maintenance Systems: Fixed time maintenance, Condition based Maintenance, Operate to failure, Opportunity Maintenance, Design out maintenance, Total Productive Maintenance. Preventive Maintenance: Designing a Technically sound preventive maintenance program, failure data, FCECA, Maintenance to prevent failures, lubrication program development.

16 Hrs

UNIT- 4

Inspection Decision: Optimal Inspection frequency (for maximization of profit and minimization of downtime). NUCREC Method of prioritizing maintenance work. **16 Hrs**

UNIT-5

Shut down planning using CPM & PERT. Spare Parts Management: Classification of spares, traditional approach to spares inventory, MUSIC-3D Approach to spares inventory, optimum number of spares to satisfy given service level, simulation technique.

16 Hrs

Reference Books:

1. A KELLY AND M J HARRIS, "Management of Industrial Maintenance", Butterworth's Co, Ltd.
2. AKS JARDINE "Maintenance, Replacement and Reliability" Pitman publishing Co.
3. A KELLY, "Maintenance planning and control", Butterworth Co, Ltd.

Course Articulation Matrix

CO s	CO %	PO s and PSO s Mapping														
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3	3	3			3				3	3	3
CO2		3	3	3	3	3	3			3				3	3	3
CO3		3	3	3	3	3	3			3				3	3	3
CO4		3	3	3	3	3	3			3				3	3	3
CO5		3	3	3	3	3	3			3				3	3	3
Total																

		PO s and PSO s Attainment														
CO1																
CO2																
CO3																
CO4																
CO5																
Total																
Attainment																

Department: **Mechanical Engineering, SJCE, Mysuru**

Subject Name & Code	**TRIBOLOGY AND BEARING DESIGN MMT120**
No. of Teaching Hours – 52 + 26	**Credits : 4:1:0 L-T-P**
CIE Marks: 50	**SEE Marks: 100**

Course Objectives:

1. To explain various aspects of friction, lubrication classification and hydrodynamic lubrication.
2. To describe with sketches the concept of mechanism of pressure development in an oil film, pad bearings, viscosity and viscosity measuring apparatus and related numerical problems.
3. To analyze oil flow and thermal equilibrium in journal bearing, hydrostatic bearing, derive expression for load carrying capacity and oil flow through bearing, and solve related numerical problems.
4. To analyze the different types of bearing materials, wear, their properties, classify wear and its measurements.
5. To describe Wear of ceramic materials, wear measurements, effects of speed, temperature and pressure, improving design and surface engineering.

Course outcomes:

At the end of the course the students shall have the abilities to:

CO1	Explain various aspects of friction, lubrication classification and hydrodynamic lubrication.	PO1, PO2, PO3, PO4, PO5, PO6, PSO1, PSO2, PSO3
CO2	Describe with sketches the concept of mechanism of pressure development in an oil film, pad bearings, viscosity and viscosity measuring apparatus and related numerical problems.	PO1, PO2, PO3, PO4, PO5, PO6, PSO1, PSO2, PSO3

CO3	Analyze oil flow and thermal equilibrium in journal bearing, hydrostatic bearing, derive expression for load carrying capacity and oil flow through bearing, and solve related numerical problems.	PO1, PO2, PO3, PO4, PO5, PO6, PSO1, PSO2, PSO3
CO4	Analyze the different types of bearing materials, wear, their properties, classify wear and its measurements.	PO1, PO2, PO3, PO4, PO5, PO6, PSO1, PSO2, PSO3
CO5	Describe Wear of ceramic materials, wear measurements, effects of speed, temperature and pressure, improving design and surface engineering.	PO1, PO2, PO3, PO4, PO5, PO6, PSO1, PSO2, PSO3

Course Content

UNIT – 1

Introduction To Tribology: Properties of oils and equation of flow: Viscosity, Newton's Law of viscosity, Hagen-Poiseuille Law, Flow between parallel stationary planes, viscosity measuring apparatus. Lubrication principles, classification of lubricants.

Hydrodynamic Lubrication: Friction forces and power loss in lightly loaded bearing, Petroff's law, Tower's experiments, idealized full journal bearings. **16 Hrs**

UNIT – 2

Mechanism Of Pressure Development In An Oil Film: Reynold's investigations, Reynold's equation in two dimensions. Partial journal bearings, end leakages in journal bearing, numerical problems.

Slider / Pad Bearing With A Fixed And Pivoted Shoe: Pressure distribution, Load carrying capacity, coefficient of friction, frictional resistance in a pivoted shoe bearing, influence of end leakage, numerical examples. **16 Hrs**

UNIT – 3

Oil Flow And Thermal Equilibrium Of Journal Bearing: Oil flow through bearings, self-contained journal bearings, bearings lubricated under pressure, thermal equilibrium of journal bearings.

Hydrostatic Lubrication: Introduction to hydrostatic lubrication, hydrostatic step bearings, load carrying capacity and oil flow through the hydrostatic step bearing. **16 Hrs**

UNIT – 4

Bearing Materials: Commonly used bearings materials, properties of typical bearing materials.

Wear: Classification of wear, wear of polymers, wear of ceramic materials, wear measurements, effect of speed, temperature and pressure. **15 Hrs**

UNIT – 5

Behavior of Tribological Components: Selection, friction, Wear of ceramic materials, wear measurements, effects of speed, temperature and pressure. Tribological measures, Material selection, improved design, surface engineering. **15 Hrs**

Text books:

1. Basu S K., Sengupta A N., Ahuja B. B., Fundamentals of Tribiology PHI 2006.
2. Mujumdar B. C., Introduction to Tribiology Bearings, S. Chand company pvt. Ltd 2008.

Reference books:

1. Fuller, D., Theory and Practice of Lubrication for Engineers, New York company 1998.
2. Principles and Applications of Tribiology, Moore, Pergamaon press 1998.
3. Srivastava S., Tribiology in Industries, S Chand and Company limited, Delhi 2002.
4. Redzimovskay E I., Lubrication of bearings – Theoretical Principles and Design, Oxford press company 2000.

Course Articulation Matrix

CO	CO %	PO s and PSO s Mapping														
		PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1	PSO	PSO	PSO
CO1		3	3	3	3	3	3							3	3	3
CO2		3	3	3	3	3	3							3	3	3
CO3		3	3	3	3	3	3							3	3	3
CO4		3	3	3	3	3	3							3	3	3
CO5		3	3	3	3	3	3							3	3	3
Total																

		PO s and PSO s Attainment														
CO1																
CO2																
CO3																
CO4																
CO5																
Total																
Attainme																

Department: **Mechanical Engineering, SJCE, Mysuru**

Subject Name & Code	**ADVANCED THEORY OF VIBRATIONS MMT130**
No. of Teaching Hours – 52 + 26	**Credits : 4:1:0 L-T-P**
CIE Marks: 50	**SEE Marks: 100**

Course Objectives:

1. To apply fundamental concepts of mechanical vibration, analysis and solve related numerical problems.
2. The analyze systems with more than one degree of freedom and solve related numerical problems.
3. To describe various measuring instruments and their application used in vibration analysis.
4. To evaluate Eigen value, transfer matrix and modal analysis problems.
5. To analyze non-linear vibrations using analytical and graphical methods.

Course outcomes:

At the end of the course the students shall have the abilities to:

CO1	Apply fundamental concepts of mechanical vibration, analysis and solve related numerical problems.	PO1, PO2, PO3, PO4, PO5, PO6,PSO1, PSO2, PSO3
CO2	Analyze systems with more than one degree of freedom and solve related numerical problems.	PO1, PO2, PO3, PO4, PO5, PO6,PSO1, PSO2, PSO3
CO3	Describe various measuring instruments and their applicationused in vibration analysis.	PO1, PO2, PO3, PO4, PO5, PO6,PSO1, PSO2, PSO3

CO4	Evaluate Eigen value, transfer matrix and modal analysis problems.	PO1, PO2, PO3, PO4, PO5, PO6,PSO1, PSO2, PSO3
CO5	Analyze non-linear vibrations using analytical and graphical methods.	PO1, PO2, PO3, PO4, PO5, PO6,PSO1, PSO2, PSO3

UNIT-1

System with single degree of freedom: Review of free and forced vibration with or without different types of damping, vibration isolation and transmissibility. **16 Hrs**

UNIT-2

System with More than one degree of freedom: Systems, with two degree of freedom, undamped vibration absorbers, equation of motion using influence Coefficients, generalized co- ordinates and co-ordinates coupling, orthogonality of natural modes; free and forced vibration of multi-degree of freedom with viscous Damping: Lagrange's equations.

16 Hrs

UNIT-3

Vibration Measuring Instruments & Application: Accelerometer and vibrations. Vehicle suspension, Dynamic vibration Absorber, Dynamics of Reciprocating Engines.

15 Hrs

UNIT-4

Solution of Eigen-Value problem, Transfer Matrix and Modal Analysis: self-excited vibrations; criterion of stability; effect of friction OIL stability with common examples. **15 Hrs**

UNIT-5

Non-Linear Vibrations: Introduction of Non-linear vibration, free vibration with Non-linear spring force or non-linear damping, phase plane, energy curves, integral curves lie nard's graphical construction, method of isoclines**.** **15 Hrs**

Text Books:

1. Meirovitch, "Elements of Vibration Analysis", McGraw Hill.
2. Kelly, Schaum's"Mechanical Vibrations" Outline Series, Mc Graw Hill 1996.

Reference Books:

1. W. T. Thomson, M. D. Dahleh and C. Padmanabhan,"Theory of Vibration with Applications", Pearson Education Inc, 5th edition, 2008.
2. S. Graham Kelly, Schaum's, "Mechanical Vibrations"outline Series, Tata McGraw Hill, Special Indian Edition, 2007.
3. J. S. Rao& K,"Theory and Practice of Mechanical Vibrations".

Course Articulation Matrix

CO s	CO %	PO s and PSO s Mapping														
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3	3	3							3	3	3
CO2		3	3	3	3	3	3							3	3	3
CO3		3	3	3	3	3	3							3	3	3
CO4		3	3	3	3	3	3							3	3	3
CO5		3	3	3	3	3	3							3	3	3
Total																

		PO s and PSO s Attainment														
CO1																
CO2																
CO3																
CO4																
CO5																
Total																
Attainment																

Department: **Mechanical Engineering, SJCE, Mysuru**

Subject Name & Code	**QUALITY AND RELIABILITY ENGINEERING MMT141**
No. of Teaching Hours – 52 + 26	**Credits : 4:1:0 L-T-P**
CIE Marks: 50	**SEE Marks: 100**

Course Objectives:

1. To explain quality, reliability, quality control and statistical quality control.
2. To explain and apply statistical tools in quality control and solve related numerical problems.
3. To analyze failure data, hazard models, system reliability and solve related numerical problems.
4. To apply reliability improvement and allocation methods to engineering systems.
5. To explain maintainability and availability concepts to improve the system effectiveness.

Course outcomes:

At the end of the course the students shall have the abilities to:

CO1	Explain quality, reliability, quality control and statistical quality control.	PO1, PO2, PO6, PO3, PSO1, PSO2, PSO3
CO2	Explain and apply statistical tools in quality control, and solve related numerical problems.	PO1, PO2, PO6, PO3, PSO1, PSO2, PSO3
CO3	Analyze failure data, hazard models and system reliability and solve related numerical problems.	PO1, PO2, PO6, PO3, PSO1, PSO2, PSO3

CO4	Apply reliability improvement and allocation methods to engineering systems.	PO1, PO2, PO6 PO3, PSO1, , PSO2, PSO3
CO5	Explain maintainability and availability concepts to improve the system effectiveness.	PO1, PO2, PO6 PO3, PSO1, , PSO2, PSO3

Course content

UNIT-1

Basic Concepts: Definitions of Quality and Reliability, Parameters and Characteristics, Quality control, Statistical Quality Control, Reliability concepts. **Concepts in Probability and Statistics** Events, Sample Space, Probability rules, Conditional probability, Dependent and Independent Events, Application of Probability concepts in Quality Control, Problems.

16 Hrs

UNIT-2

Statistical Aspects and Probability Distributions: Statistical Tools in Quality Control, The Concept of Variation, Graphical Tools for data representation and analysis, Discrete and Continuous Distributions, Normal, Poisson, Binomial, Weibull Distribution, Problems. **Failure Data Analysis:** Introduction, Failure Data, Quantitative measures, MTTF, MTBF, Bathtub Curve, Mean Life, Life Testing, Problems, Introduction to Failure Mode and Effect Analysis.

16 Hrs

UNIT-3

Hazard Models: Introduction, Constant Hazard, Linearly increasing hazard, the Weibull model, (Derivation not required, emphasis to be on applications). System reliability Series, Parallel and Mixed Configurations, Block Diagram Concept, r-out-of-n structure,

Solving problems using mathematical models. **16 Hrs**

UNIT-4

Reliability Improvement and Allocation: Difficulty in achieving reliability, Methods for improving reliability during design, Different techniques available to improve reliability, Optimization, Reliability-Cost trade off, Elements of a typical reliability program, Setting overall reliability goals, Reliability Apportionment, Prediction and Analysis, Problems.

15 Hrs

UNIT-5

Maintainability and Availability: Introduction, Formulas, Techniques available to improve maintainability and availability, trade-off among reliability, maintainability and availability, Simple problems. **15 Hrs**

Text Books:

1. Halpern, Seigmund,"The Assurance Sciences", Prentice Hall International, New Jersey, U.S.A. (1978).
2. Srinath, L.S,"Concepts in Reliability Engineering", Affiliated East-West Press Private Limited, New Delhi, India, (1985).

Reference Books:

1. Juran, J.M. and Gryna, F.M,"Quality Planning and Analysis", Tata McGraw Hill publishing Company Ltd., New Delhi, India. (1982).
2. Blanchard, Benjamin S,"Logistics Engineering and Management", Prentice Hall International, New Jersey, U.S.A. (1986).
3. Kraus, John W, "Maintainability and Reliability", Handbook of Reliability I Engineering and Management, Editors -Ireson. W .*a.* and Coombs, C.F. McGraw Hill, Book Company Inc., U .S.A. (1988).

Course Articulation Matrix

COs	CO %	PO s and PSO s Mapping														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO		3	3	3			3							3	3	3
CO		3	3	3			3							3	3	3
CO		3	3	3			3							3	3	3
CO		3	3	3			3							3	3	3
CO		3	3	3			3							3	3	3
Total																

		PO s and PSO s Attainment														
CO																
CO																
CO																
CO																
CO																
Total																
Attainment																

Department: **Mechanical Engineering, SJCE, Mysuru**

Subject Name & Code	**NON DESRUCTIVE TESTING** **MMT151**
No. of Teaching Hours – 52 + 26	**Credits : 4:1:0 L-T-P**
CIE Marks: 50	**SEE Marks: 100**

Course Objectives:

1. To explain basic principles of various NDT methods with appropriate sketches and to identify advantages and limitations of them.
2. To explain basic principles of various NDT methods with appropriate sketches and to identify advantages and limitations of them.
3. To explain with sketches basic equipments, types of waves, methods and equipments, standard reference blocks of ultrasonic inspection in casting, extrusions, rolled products, weld sets.
4. To explain with sketches various radiation sources, equipment characteristics of radiography and thermal inspection, to identify applications.
5. To describe Basics of Holography and Acoustical Holography, recording, reconstruction, procedures of inspection, typical applications, to explain systems, techniques and applications. Current Literature.

Course outcomes:

At the end of the course the students shall have the abilities to:

CO1	Understand various NDT methods and suggest methods for various applications, explain with sketches, visual inspection, leaks testing, and liquid penetration inspection, identify advantages and limitations of them.	PO1, PO2, PO6, PO3, PSO1, PSO2, PSO3

CO2	Explain with sketches principles of eddy current, magnetic particle and microwave inspections, describe with sketches operation variables, procedure, inspection coils, methods of generating magnetic field, list types of magnetic particles, and suspension liquids and steps in inspection.	PO1, PO2, PO6, PO3, PSO1, PSO2, PSO3
CO3	Explain with sketches equipment, characteristics of ultrasonic waves, variables, compare and contrast between inspection methods like pulse echo, A, B, C scans transmission, resonance techniques, transducer elements, couplets, contact types and immersion type inspection.	PO1, PO2, PO6, PO3, PSO1, PSO2, PSO3
CO4	Describe with sketches X-Ray and gamma ray tubes, radio graphic films, and filters, image intensifiers and techniques, describe industrial radiography, image quality and radiography sensitivity, thermal inspection principles, equipment inspection methods, compare and contrast between electron and neural radiology.	PO1, PO2, PO6, PO3, PSO1, PSO2, PSO3
CO5	Explain with sketches holography principle, recording and reconstruction, procedures of inspection and list typical applications; explain with sketches acoustical holography systems, techniques and applications. Prepare write-ups on advanced topics. (Current Literature)	PO1, PO2, PO6, PO3, PSO1, PSO2, PSO3

Course

Content

UNIT- 1

Introduction to ND Testing: selection of ND methods, visual inspection, leaks testing, liquid penetration inspection, its advantages and limitations. **15 Hrs**

UNIT- 2

Eddy current, Magnetic Particle and microwave inspections: principles, operation variables, procedure, inspection coils, Methods of generating magnetic field, types of magnetic particles, suspension liquids, steps in inspection, applications and limitations Microwave principles and detectable defects by this method. **16 Hrs**

UNIT- 3

Ultrasonic inspection: Basic equipment, characteristics of ultrasonic waves, variables, inspection methods; pulse echo, A,B,C scans transmission, resonance techniques, transducer elements ,couplets, search units, contact types and immersion types inspection standards: standard reference blocks, inspection of products like casting, extrusions, rolled products, weld sets. **16 Hrs**

UNIT- 4

Radiography inspection: Principles, radiation sources: X-Ray and gamma ray tubes, radio graphic films, and filters, image intensifiers and techniques, charts, industrial radiography, image quality, radiography sensitivity, Electron and Neural radiology, application of ICT, Thermal inspection principles, equipment inspection methods, applications. **16 Hrs**

UNIT- 5

Optical Holography: Basics of Holography, recording and reconstruction, procedures of inspection, typical applications. Acoustical Holography: systems, techniques and applications. Current Literature. **15 Hrs**

Text Books:

1. Non destructive Evolution and quality control volume l~ of metals hand book 9 Editionasia internal 1989.

Reference Books:

1. McGonnagle, JJGarden and Reach**,** "Non Destructive testing", New York.
2. Davis H.E Troxel G .E wiskovil C.T**,** “Testing instruction of Engineering materials"**,** Mc Graw Hill.

Course Articulation Matrix

COs	CO %	PO s and PSO s Mapping														
		PO	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO		3	3	3			3							3	3	3
CO		3	3	3			3							3	3	3
CO		3	3	3			3							3	3	3
CO		3	3	3			3							3	3	3
CO		3	3	3			3							3	3	3
Total																

		PO s and PSO s Attainment														
CO																
CO																
CO																
CO																
CO																
Total																
Attainment																

Department: **Mechanical Engineering, SJCE, Mysuru**

Subject Name & Code	**NON DESRUCTIVE TESTING (NDT) LABAROTARY MMT16L**
No. of Teaching Hours – 39	**Credits : 0:0:1.5 L-T-P**
CIE Marks: ---	**SEE Marks: ---**

Course Objectives:

1. To explain basic principles of various NDT methods like Visual Inspection, Leak Testing, Magnetic Particle and liquid penetration testing, Ultrasonic and Eddy current testing.
2. To explain with sketches operation variables and parts or components of Visual Inspection, Leak Testing, Magnetic Particle tests, Ultrasonic and Eddy current testing and to identify test standards for them.
3. To conduct visual inspection on castings, welding and gear blocks.
4. To conduct experiments and determine location, and extent of surface and sub surface defects using the above mentioned techniques.

Course outcomes:

At the end of the course the students shall have the abilities to:

CO1	Explain the various components, methods, standards and techniques associated with Visual Inspection, Leak Testing, Magnetic Particle and liquid penetration testing, Ultrasonic and Eddy current testing.	PO1, PO2, PO3, PO4,PO5, PO6, PO9, PO10, PO12, PSO1, PSO2, PSO3
CO2	Apply the above mentioned knowledge of Testing and standards in these techniques and detect the extent and their location of defects and analyze the test results, make inferences and suggest the best technique.	PO1, PO2, PO3, PO4,PO5, PO6, PO9, PO10, PO12, PSO1, PSO2, PSO3

Course content

Experiment – 1

Conduct experiments to detect defects causing leakage in fluid containers. **12 Hrs**

Experiment – 2

Conduct experiments to detect surface defects using magnetic particle and liquid penetration testing. **15 Hrs**

Experiment – 3

Conduct experiments to detect surface and sub surface defects, their location and extend using Ultrasonic and Eddy current testing. **12 Hrs**

Course Articulation Matrix

CO s	CO %	**PO s and PSO s Mapping**														
		PO	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3	3	3			3	3		3	3	3	3
CO2		3	3	3	3	3	3			3	3		3	3	3	3
Total																

		PO s and PSO s Attainment														
CO1																
CO2																
Total																
Attainment																

Department: **Mechanical Engineering, SJCE, Mysuru**

Subject Name & Code	**FAILURE MECHANISM AND ANALYSIS MMT210**
No. of Teaching Hours – 52 + 26	**Credits : 4:1:0 L-T-P**
CIE Marks: 50	**SEE Marks: 100**

Course Objectives:

1. To explain types, fundamental causes and objectives of failure analysis.
2. To describe different forms of corrosion and failure mechanisms.
3. To explain with sketches different types of wear and failure mechanisms.
4. To analyze the failure mechanisms of mechanical components.
5. To describe with sketches the different tools and techniques used for failure analysis.

Course outcomes:

At the end of the course the students shall have the abilities to:

CO1	Explain types, fundamental causes and objectives of failure analysis.	PO1, PO2, PO5, PO3, PSO1, PSO2, PSO3
CO2	Describe different forms of corrosion and failure mechanisms.	PO1, PO2, PO5, PO3, PSO1, PSO2, PSO3
CO3	Explain with sketches different types of wear and failure mechanisms.	PO1, PO2, PO5, PO3, PSO1, PSO2, PSO3
CO4	Analyze the failure mechanisms of mechanical components.	PO1, PO2, PO5, PO3, PSO1, PSO2, PSO3
CO5	Describe with sketches the different tools and techniques used for failure analysis.	PO1, PO2, PO5, PO3, PSO1, PSO2, PSO3

Course Content

UNIT-1

Introduction to Failure Analysis: Classification, Fundamental causes of failure, Objectives of Failure analysis, Metallurgical failure analysis. Fracture classification, Brittle, Ductile and Fatigue fractures, Fractography. **15 Hrs**

UNIT-2

Environment Induced Failures: Corrosion damage, Forms of corrosion, Hydrogen degradation, Liquid metal embrittlement, High temperature corrosion. **16 Hrs**

UNIT-3

Wear Failures: Types and mechanisms of wear, Examination and analysis. **16 Hrs**

UNIT-4

Failure Analysis of Mechanical Components: Shafts, Bearings, Gears, Friction surfaces and Seals, Creep failure, Stress rupture, Failure of pressure vessels. **15 Hrs**

UNIT-5

Tools for Failure Analysis: Metallurgical microscope, Scanning Electron Microscope, NDT Techniques, Chemical analysis. **16 Hrs**

Text Book:

1. Failure Analysis & Prevention American Society of Metal Handbook V 10.11 and 17.

Reerence Books:

1. L.F. Pau “Failure Diagnosis and Performance Monitoring”.
2. H.P. Garg “Industrial Maintenance”.

Course Articulation Matrix

CO s	CO	PO s and PSO s Mapping														
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO1	PO1	PSO	PSO	PSO
CO1		3	3	3		3								3	3	3
CO2		3	3	3		3								3	3	3
CO3		3	3	3		3								3	3	3
CO4		3	3	3		3								3	3	3
CO5		3	3	3		3								3	3	3
Total																

		PO s and PSO s Attainment														
CO1																
CO2																
CO3																
CO4																
CO5																
Total																
Attainme																

Department: **Mechanical Engineering, SJCE, Mysuru**

Subject Name & Code	**MAINTENANCE OF MACHINERY MMT220**
No. of Teaching Hours – 52 + 26	**Credits : 4:1:0 L-T-P**
CIE Marks: 50	**SEE Marks: 100**

Course Objectives:

1. To explain the modes of mechanical failures, and its importance in maintenance.
2. To explain the concept of performance standards, functional failures and failure effects.
3. To describe the entire failure consequences by knowing the failure consequences of hidden, safety and environmental, operational and non-operational consequences.
4. To analyze RCM, its implementation, and its benefits.
5. To classify the machines based on its functions and processes and explain the maintenance procedures and processes.

Course outcomes:

At the end of the course the students shall have the abilities to:

CO1	Define different failure modes and explain their importance in maintenance.	PO1, PO2, PO6 PO3, PSO1,
CO2	Explain **f**unctions and Performance Standards, functional failures, failure effects and hidden, safety, environmental, operational and non-operational consequences.	PO1, PO2, PO6 PO3, PSO1, PSO2, PSO3
CO3	Analyze changing world of maintenance, maintenance and RCM, the seven basic questions, implementing RCM and achievements of RCM.	PO1, PO2, PO6 PO3, PSO1, PSO2, PSO3
CO4	Explain with sketches and classify mechanical equipments machine tools, utilities, working principle, maintenance needs and efforts, Pneumatics and Hydraulics.	PO1, PO2, PO6 PO3, PSO1, PSO2, PSO3
CO5	Describe maintenance procedures and processes, and methods of stopping corrosion like Painting, Electroplating and Coating Processes.	PO1, PO2, PO6 PO3, PSO1, PSO2, PSO3

Course content

UNIT – 1

Modes of Mechanical Failure: Definition of Failure Mode -Failure modes observed in practice -Different Failure modes and their importance in maintenance. **12 Hrs**

UNIT – 2

Functions of Failure: Functions and Performance Standards -Functional Failures - Failure Modes -Failure Effects. **Failure Consequences:** Hidden Failure Consequences -Safety and Environmental consequences- Operational Consequences -Non-Operational Consequences. **20 Hrs**

UNIT – 3

Reliability Centred Maintenance: Introduction -Changing world of maintenance - Maintenance and RCM -The seven Basic Questions –Implementing RCM - Achievements of RCM. **15 Hrs**

UNIT – 4

Classification of mechanical Equipments and its maintenance : Machine Tools- Utilities- Equipment- working principal – Basic Maintenance needs- Maintenance efforts – trouble shooting- maintenance checklists- Pneumatics and Hydraulics in Maintenance.

16 Hrs

UNIT – 5

Maintenance Procedures and Processes: Methods of Stopping Corrosion –Painting, Electroplating and Coating Processes. **15 Hrs**

Reference Books:

1. William T. File- Butterworth and Heinemann, "Cost Effective Maintenance -Design and Implementation".
2. John Moubray -Butterworth and Heinemann, "Reliability Centred Maintenance".
3. "Lindley Higgings","Maintenance Engineering Handbook".
4. Stainer,"Plant Engineering Handbook" -McGraw Hill.
5. J.A. -John wiley and Sons,"Failure of Materials in Mechanical Designs -Analysis, Prediction and Prevention" - Collins.

Course Articulation Matrix

CO s	CO %	PO s and PSO s Mapping														
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3			3							3	3	3
CO2		3	3	3			3							3	3	3
CO3		3	3	3			3							3	3	3
CO4		3	3	3			3							3	3	3
CO5		3	3	3			3							3	3	3
Total																

		PO s and PSO s Attainment														
CO1																
CO2																
CO3																
CO4																
CO5																
Total																
Attainment																

Department: **Mechanical Engineering, SJCE, Mysuru**

Subject Name & Code	**CONDITION BASED MAINTENANCE MMT230**
No. of Teaching Hours – 52 + 26	**Credits : 4:1:0 L-T-P**
CIE Marks: 50	**SEE Marks: 100**

Course Objectives:

1. To describe principal types, methods, economics and computer applications in condition monitoring.
2. To explain and apply vibration monitoring methods and analyze machinery signatures.
3. To apply the knowledge of dynamic balancing, alignment of machinery and condition monitoring and analyze them regarding ball and roller bearings.
4. To analyze wear monitoring, lubricant analysis, corrosion monitoring and specialized condition monitoring techniques and arrive at inferences.
5. To describe case studies of various manufacturing systems related to condition monitoring.

Course outcomes:

At the end of the course the students shall have the abilities to:

CO1	Explain principal types, methods, Economics and applications, and computer applications in condition monitoring.	PO1, PO2, PO3, PO4, PO5, PO7. PO9, PO12 PSO1, PSO2, PSO3
CO2	Explain and apply vibration monitoring methods and analyze machinery signatures.	PO1, PO2, PO3, PO4, PO5, PO7. PO9, PO12 PSO1, PSO2, PSO3
CO3	Describe dynamic balancing, alignment of machinery, and condition monitoring of ball and roller bearings.	PO1, PO2, PO3, PO4, PO5, PO7. PO9, PO12 PSO1, PSO2, PSO3

CO4	Analyze mechanical fault diagnosis by wear monitoring, lubricant analysis, performance trend and corrosion monitoring.	PO1, PO2, PO3, PO4, PO5, PO7. PO9, PO12 PSO1, PSO2, PSO3
CO5	Describe with sketches Thermography, Radiography, Ferrography, Acoustic emission and Noise monitoring, on line monitoring and diagnostic systems and condition monitoring in various plants.	PO1, PO2, PO3, PO4, PO5, PO7. PO9, PO12 PSO1, PSO2, PSO3

Course content

UNIT-1

Condition Based Maintenance: Principal types and methods, Economics and application, Computer applications to condition monitoring. **15 Hrs**

UNIT-2

Vibration Monitoring and analysis. **16 Hrs**

UNIT-3

Dynamic balancing and alignment of machinery. Condition monitoring of ball and roller bearings. **16 Hrs**

UNIT-4

Mechanical fault diagnosis by wear monitoring and lubricant analysis. Performance trend monitoring, Corrosion monitoring. **15 Hrs**

UNIT-5

Specialized condition monitoring techniques: Thermograph, Radiography, Ferrography, Acoustic emission monitoring, Noise monitoring. On line monitoring and diagnostic systems. Condition monitoring in power plants, chemical plants and petrochemical plants.

16 Hrs

Text Books:

1. R.A. Caollactt Chapman and hall, "Mechanical Fault Diagnosis and Condition Monitoring",1977.

Reference Books:

1. L.F. Pau Marcel Deker, Failure Diagnosis and Performance Monitoring.
2. Condition Monitoring and Condition based Maintenance, Update CEP ISTE New Delhi.

Course Articulation Matrix

CO s	CO %	PO s and PSO s Mapping														
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3	3		3		3			3	3	3	3
CO2		3	3	3	3	3		3		3			3	3	3	3
CO3		3	3	3	3	3		3		3			3	3	3	3
CO4		3	3	3	3	3		3		3			3	3	3	3
CO5		3	3	3	3	3		3		3			3	3	3	3
Total																

		PO s and PSO s Attainment														
CO1																
CO2																
CO3																
CO4																
CO5																
Total																
Attainment																

Department: **Mechanical Engineering, SJCE, Mysuru**

Subject Name & Code	**NOISE MEASUREMENT ANALYSIS & CONTROL MMT241**
No. of Teaching Hours – 52 + 26	**Credits : 4:1:0 L-T-P**
CIE Marks: 50	**SEE Marks: 100**

Course Objectives:

1. To explain acoustics sound and noise in machineries.
2. To classify sound and noise and explain harmful effects and develop programs for effective measurement of noise.
3. To classify and differentiate between sound and noise, discuss the useful and harmful effects, issues related to machinery acoustics.
4. To describe how sound is produced and propagated through various media.
5. To explain how sound is measured using various types of instrumentation systems using various configurations, new technology adaptive noise control techniques.

Course outcomes:

At the end of the course the students shall have the abilities to:

CO1	Explain acoustics sound and noise in machineries.	PO1, PO2, PO3, PO4, PO5, PO7. PO9, PO12 PSO1, PSO2, PSO3
CO2	Classify sound and noise and explain harmful effects and develop programs for effective measurement of noise.	PO1, PO2, PO3, PO4, PO5, PO7. PO9, PO12 PSO1, PSO2, PSO3

CO3	Classify and differentiate between sound and noise, discuss the useful and harmful effects, issues related to machinery acoustics.	PO1, PO2, PO3, PO4, PO5, PO7. PO9, PO12 PSO1, PSO2, PSO3
CO4	Describe how sound is produced and propagated through various media.	PO1, PO2, PO3, PO4, PO5, PO7. PO9, PO12 PSO1, PSO2, PSO3
CO5	Explain how sound is measured using various types of instrumentation systems using various configurations, new technology adaptive noise control techniques.	PO1, PO2, PO3, PO4, PO5, PO7. PO9, PO12 PSO1, PSO2, PSO3

Course content

UNIT-1

Understanding Acoustics – Acoustics – science of sound, classification of acoustics, musical, machinery, building, architectural,, production and propagation of sound, sound basics, sound frequency, spectrum, characteristics of sound, propagation of sound , effect of sound due to nature, wind velocity, temperature and moisture effects, Reflection, refraction, transmission, diffraction and absorption of sound, effect of standing wave, transmission of sound in thin and thick barrier, anechoic chamber and reverberation rooms, Sound Fields, Near field, far field, free field, reverberant field, diffused fields, inverse square law, sound directivity index and factor.
SLE: Propagation of Sound, Effects of Nature, Spectrum, Sound Fields, Standing Wave.

16 Hrs

UNIT-2

Noise – Categories of noise, pitched, unpitched, impact noise features and examples, analogies of sound and noise in power and pressure units, units of sound/noise, Sound pressure level, Sound Power level, Sound intensity level, manipulation of sound, problems on addition and subtraction of sources using analytical and graphical methods, Noise sources, Point, line and Plane sources, characteristic features, Sound/Noise frequency, categorization of frequency, harmful effects of noise on important frequency bands. **SLE:** Sound Levels- Pressure, Power and Intensity, Manipulation of Noise, Solutions – Graphical and Analytical.

16 Hrs

UNIT-3

Sound/Noise Measurement – Sound/Procedure for noise measurement – Field visit, development of layout and execution of systematic measurement plan, Instrumentation for noise measurement, types of sound measurement systems, sound noise standards, importance of standards, noise regulation, block diagram of sound pressure measurement system, sound intensity measurement system, importance of microphones for measurement, types of microphones, types of noise measurement systems, sound analysis, frequency analysis, use of octave filters for measurements. **SLE:** Microphone, Measurement Systems, In Situation and Field Measurement and Analysis. **16 Hrs**

UNIT-4

Sound / Noise Control- Importance of noise control, Types of controls, Active and passive noise control, control at source, along path and at the receiver end, active noise control principle, use of sound absorbing materials, configurations of noise absorbing materials, acoustic silencers, noise curtains, enclosures, use of composites for effective noise control. Low and high frequency noise absorption, Noise control in buildings, Problems on various design aspects, Reverberation Time, Measurement of Reverberation Time, importance in building acoustics. **SLE:** Passive Control Methods Sound Absorbing Materials, Configurations.

15 Hrs

UNIT-5

Noise Regulation – Daytime noise and Night time noise levels, permitted noise levels, how much

of sound is too much of sound, Noise Standards in practice, OSHA standard, BIS standard, other noise measurement features, weighted networks, equal loudness contours, Equivalent Sound level, Traffic Noise index, Noise rating curves NRC – Practical measurement in Engine room, around automotive engines, mapping of noise, few case studies and real time problems for discussion and analysis and solutions. **SLE:** Standards and Regulation, NRC, TNI, Real Time Measurement and Analysis, Problems and Case Studies related to buildings and Machinery Acoustics. **15 Hrs**

Text Books:

1. John E. Foreman Van Nostrand, "Sound Analysis and Noise Control" Reinhold Publication.

Reference Books:

1. Dudley, "Machinery noise control".
2. Edward B. Magrab, “Environmental Noise Control”.
3. Bruel and Kjaer, “Noise-Analysis and Control”–Sound Measurement Review, Denmark.
4. Lawrence Kinsler and Austin Frey, “Fundamentals of Acoustics”.

Course Articulation Matrix

CO s	CO %	PO s and PSO s Mapping														
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3	3		3		3			3	3	3	3
CO2		3	3	3	3	3		3		3			3	3	3	3
CO3		3	3	3	3	3		3		3			3	3	3	3
CO4		3	3	3	3	3		3		3			3	3	3	3
CO5		3	3	3	3	3		3		3			3	3	3	3
Total																

		PO s and PSO s Attainment														
CO1																
CO2																
CO3																
CO4																
CO5																
Total																
Attainment																

Department: **Mechanical Engineering, SJCE, Mysuru**

Subject Name & Code	**PLANT ENGINEERING MMT252**
No. of Teaching Hours – 52 + 26	**Credits : 4:1:0 L-T-P**
CIE Marks: 50	**SEE Marks: 100**

Course Objectives:

1. To define various terms and to explain the scope and mention the importance of facilities design function.
2. To explain with sketches various plant utilities and to list factors, characteristics influencing in selection of them.
3. To explain with sketches distributions and control system of Air conditioning and to calculate air quantity required, heat losses and gains.
4. To explain need for energy conservation, Energy audit and Energy Management, and to explain the factors involving motivation and training in facilities design, and to explain housekeeping scope, standards, materials and tools and supervision.
5. To define various terms and to explain the scope and mention the importance of facilities design function.

Course outcomes:

At the end of the course the students shall have the abilities to:

CO1	Define various terms, explain scope, mention objectives and importance of facilities design process, Discuss types and characteristics of layout problems, explain factors involved in facilities design and procedure.	PO1, PO2, PO3, PO4, PO5, PO7. PO9, PO12 PSO1, PSO2, PSO3
CO2	Explain electricity generation, factors influencing it, various plants; with sketches explain different types of boilers and their accessories and controls. Describe energy conservation, noise control in boiler house.	PO1, PO2, PO3, PO4, PO5, PO7. PO9, PO12 PSO1, PSO2, PSO3

CO3	Describe with sketches different air conditioning systems, explain air conditioning distribution and system resistance, fans, dust control filtration, humidification, calculate air quantity required, losses and gains in heat, list Test procedures for air- conditioning systems heating and ventilation.	PO1, PO2, PO3, PO4, PO5, PO7. PO9, PO12 PSO1, PSO2, PSO3
CO4	Discuss need for energy conservation, major areas of energy conservation and its audit, energy management, discuss motivation and training in facilities design.	PO1, PO2, PO3, PO4, PO5, PO7. PO9, PO12 PSO1, PSO2, PSO3
CO5	Discuss requirements of water for plants, explain water chemistry, with sketches explain water purification process and comment on effluents. Discuss housekeeping scope and standards; explain use of materials and tools for good housekeeping and supervision.	PO1, PO2, PO3, PO4, PO5, PO7. PO9, PO12 PSO1, PSO2, PSO3

Course content

UNIT- 1

Facilities Design Function: Definitions, Scope, importance, objectives, functions and activities, facilities design process, types of layout problems, characteristics of good layout, the layout function, Factors for consideration in facilities designs, facilities design as a co-coordinating function, facilities design procedure. **16 Hrs**

UNIT- 2

Plant Utilities: Electricity generation: Introduction, generation of electrical power, combined heat and power, factors influencing choice, the selection, plant and installation. Types of. Boiler, Applications and solutions, super heaters, economizers, water level control, efficiency, boiler installation, automatic controls on boiler, energy conservation, noise in the boiler house.

16 Hrs

UNIT- 3

Air Conditioning: The air quantity required, heat losses and gains, air conditioning, distribution and system resistance, Fans, dust control and filtration, humidification. Test procedures for air- conditioning systems heating and ventilation. **15 Hrs**

UNIT- 4

Energy Conservation: The need for energy conservation, energy audit, energy management, major areas of energy conservation, justification for energy-conservation measures, motivation and training. **16 Hrs**

UNIT- 5

Water and Effluents: Requirements of water, water chemistry water purification processes and effluents. Housekeeping scope, standards, use of materials and tools for good housekeeping and supervision. **15 Hrs**

Text Books:

1. James M. Apple, 'Plant Layout and Material Handling',3rd EdThe Renald press company.

Reference Books:

1. Dennis A. Snsow Butterworth N. Heinemann, “Power Engineer’s reference Book”,
2. Victor J. Cotz, P.E. et, “Plant Engineer” AIS manual and guide”, PHI.
3. Charles H. Becker**,** "Plant Manager's Handbook", McGraw Hill.

Course Articulation Matrix

CO s	CO %	PO s and PSO s Mapping														
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3	3		3		3			3	3	3	3
CO2		3	3	3	3	3		3		3			3	3	3	3
CO3		3	3	3	3	3		3		3			3	3	3	3
CO4		3	3	3	3	3		3		3			3	3	3	3
CO5		3	3	3	3	3		3		3			3	3	3	3
Total																

		PO s and PSO s Attainment														
CO1																
CO2																
CO3																
CO4																
CO5																
Total																
Attainment																

Department: **Mechanical Engineering, SJCE, Mysuru**

Subject Name & Code	**DYNAMICS LAB** **MMT26L**
No. of Teaching Hours – 39	**Credits : 0:0:0.5 L-T-P**
CIE Marks:----	**SEE Marks: ---**

Course Objectives:

1. To explain the various components, methods, standards and techniques associated with Sound measurement around a surface vibrator, frequency analysis, abrasion, sound pressure level in a reverberating room, transmission and insertion losses.
2. To apply the above mentioned knowledge of testing and standards in these techniques and detect the extent and their location of defects, analyze the test results, make inferences and suggest the best technique and on various equipments and location.

Course outcomes:

At the end of the course the students shall have the abilities to:

CO1	Explain the various components, methods, standards and techniques associated with Sound measurement around a surface vibrator, frequency analysis, abrasion, sound pressure level in a reverberating room, transmission and insertion losses.	PO1,PO2,PO3, PO4,PO5, PO6, PO9, PO10, PO12, PSO1, PSO2, PSO3
CO2	Apply the above mentioned knowledge of testing and standards in these techniques and detect the extent and their location of defects, analyze the test results, make inferences and suggest the best technique and on various equipments and location.	PO1,PO2,PO3, PO4,PO5, PO6, PO9, PO10, PO12, PSO1, PSO2, PSO3

Course content

EXPERIMENT – 1	
Sound measurement around a surface vibrator - Frequency analysis.	**03 Hrs**
EXPERIMENT – 2	
Sound measurement around Los-Angeles abrasion tester - Frequency analysis.	**03 Hrs**
EXPERIMENT – 3	
Sound pressure level in a reverberating room.	**03 Hrs**
EXPERIMENT – 4	
Measurement of transmission loss of sound from a source.	**03 Hrs**
EXPERIMENT – 5	
Measurement of insertion loss of sound from a source.	**03 Hrs**
EXPERIMENT – 6	
Measurement of noise around diesel generator - Frequency analysis.	**03 Hrs**
EXPERIMENT – 7	
Measurement of noise in around multi stage air compressor - Frequency analysis.	**03 Hrs**
EXPERIMENT – 8	
Measurement of noise around an automobile Frequency analysis.-	**06 Hrs**
EXPERIMENT – 9	
Free field measurements using vacuum cleaner/blower-	**06 Hrs**
EXPERIMENT –10	
Measurement of community noise/traffic noise	**06 Hrs**

Course Articulation Matrix

CO s	CO %	PO s and PSO s Mapping														
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO 3
CO1		3	3	3	3	3	3			3	3		3	3	3	3
CO2		3	3	3	3	3	3			3	3		3	3	3	3
Total																

		PO s and PSO s Attainment														
CO1																
CO2																
Total																
Attainment																