M D U Rohtak

M. Tech(Mechanical Engineering)

CBCS Based Syllabus

w.e.f. 2016-17

M.D.UNIVERSITY, ROHTAK

SCHEME OF STUDIES AND EXAMINATION
M.TECH 1st YEAR (MECHANICAL ENGINEERING)
SEMESTER 1
CBCS Scheme effective from 2016-17

Sl. No	Course Code	Subject	Credit Pattern				Examination Schedule (Marks)				Duration of Exam (Hours)	No of Hours /week
			L	T	P	Total Credits	Marks of Class work	Theory	Practical	Total		
1	16MME21C1	Micro Machining Processes	4	0	-	4	50	100	-	150	3	4
2	16MME21C2	Computer Aided Design & Manufacturing	4	0	-	4	50	100	-	150	3	4
3	16MME21C3	IC Engine Combustion & Pollution	4	0	-	4	50	100	-	150	3	4
4	16MME21C4	Machine Tool Design	4	0	-	4	50	100	-	150	3	4
5	16MME21C5	Seminar	-	-	-	2	50	-	-	50		2
6	16MME21CL1	Computer Aided Design & Manufacturing Lab	-	-	2	2	50	-	50	100	3	4
7	16MME21CL2	IC Engine Combustion & Pollution Lab	-	-	2	2	50	-	50	100	3	4
8	16MME21CL3	Micro Machining Processes Lab	-	-	2	2	50	-	50	100	3	4
9	16MME21D1 or 16MME21D2 or16MME21D3	Elective I	4	0	-	4	50	100	-	150	3	4
		TOTAL				**28**						

NOTE:

Examiner will set nine questions in total. Question One will be compulsory and will comprise short answer type questions from all sections and remaining eight questions to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

ELECTIVE - I :Choose any one from the following three papers:

16MME21D1 - NUMERICAL METHODS & COMPUTING

16MME21D2 - METHOD ENGINEERING & ERGONOMICS

16MME21D3 - COMPUTATIONAL FLUID DYNAMICS

M.D.UNIVERSITY, ROHTAK

SCHEME OF STUDIES AND EXAMINATION

M.TECH 1st YEAR (MECHANICAL ENGINEERING)

SEMESTER 2

CBCS Scheme effective from 2016-17

Sl. No	Course Code	Subject	Credit Pattern				Examination Schedule (Marks)				Duration of Exam (Hours)	No of Hours/ week
			L	T	P	Total Credits	Marks of Class works	Theory	Practical	Total		
1	16MME22C1	Welding & Allied Processes	4	0	-	4	50	100	-	150	3	4
2	16MME22C2	Total Quality Management	4	0	-	4	50	100	-	150	3	4
3	16MME22C3	Seminar	-		-	2	50	-	-	50		2
4	16MME22CL1	Mechatronics Lab	-	-	2	2	50	-	50	100	3	4
5	16MME22CL2	Advanced Welding Lab	-	-	2	2	50	-	50	100	3	4
6	16MME22D1 or 16MME22D2 or 16MME22D3	Elective-II	4	0	-	4	50	100	-	150	3	4
7		Open Elective	3	0	-	3						
8		Foundation Elective	2	0	-	2						
		TOTAL				**23**						

NOTE: Examiner will set nine questions in total. Question One will be compulsory and will comprise short answer type questions from all sections and remaining eight questions to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

Elective II :Choose any one from the following three papers:

16MME22D1 - MODELING & SIMULATION

16MME22D2 - JIGS & FIXTURE

16MME22D3 - TOOL & DIE DESIGN

Open Elective:

A candidate has to select this paper from the pool of Open Electives provided by the University.

Foundation Elective:

A candidate has to select this paper from the pool of Foundation Electives provided by the University.

Program Specific Outcomes (PSOs) – M.Tech(Mechanical Engg)

At the end of the program, the student:

PSO1. Should be able to clearly understand the concepts and applications in various fields of Mechanical Engg viz Production, Manufacturing and Thermal.

PSO2. Should be able to associate the learning from the courses related to TQM, Machining, welding, Tool Design to arrive at solutions to real world problems.

PSO3. Should have the capability to comprehend the technological advancements in the usage of modern design tools to analyze and design subsystems/processes for a variety of applications.

PSO4. Should posses the skills to communicate in both oral and written forms, the work already done and the future plans with necessary road maps, demonstrating the practice of professional ethics and the concerns for societal and environmental wellbeing.

PSO5. Should be able to handle research problems and write dissertations.

16MME21C1- MICRO-MACHINING PROCESSES

L T P CREDIT **SESSIONAL:50Marks**
4 0 0 4 **THEORY :100 Marks**
TOTAL :150 Marks
DURATION OF EXAM.:3 Hrs.

Course Outcomes (CO): At the end of the course, the students will be able to:

CO1 Understand the basic features of EDM . ECM.

CO2 Understand the basic feature of AJM, USM etc.

CO3 Learn the MRR of various micro machining process.

UNIT-I

Introduction to New Machining Technologies : Micro electromechanical Systems (MEMS),Non Conventional Machining Process, Comparison of conventional machining processes and new technologies.

UNIT-II

Micro-electro-mechanical System Description, System Process, Micro Electromechanical systems paradigms, Materials for MEMS, Future trends: Mechanical Transducers, Optical Transducers, and Multi Disciplinary Applications.

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UNIT-III

Ultrasonic machining, Whirling jet machining, fundamental principles, process parameters characteristics, tool design, metal removal rate analysis, important part design, analysis of process. Machining Accuracy and Surface Finish Optimization.

Electro Chemical Machining-Introduction, principles, scheme, process parameters, metal removal rate, Electrochemical grinding: Introduction, tools, process parameters, metal removal rate, Honing, Accuracy and Surface finish Optimization.

UNIT-IV

EDM- Introduction – basic principles, metal removal rate, machining accuracy and surface finish optimization, selection of tool material and dielectric, analysis of process. Wire electric discharge machining: Principle, Process variables.

Reference Books:

1. Manufacturing Sciences by Ghosh & Malik.
2. Newer machining processes; H.S.Shan
3. Advance machining processes by B.Bhushan
4. Fundamentals of Micro-machiningby M.J Madou CRC Press.

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16MME21C2- COMPUTER AIDED DESIGN AND MANUFACTURING

L	T	P	CREDIT	SESSIONAL:50 Marks
4	0	0	4	THEORY :100Marks

TOTAL :150 Marks

DURATION OF EXAM.:3 Hrs.

Course Outcomes (CO's): At the end of the course, the student shall be able to:

CO1 Understand 2-D and 3-D transformations of different object based on coordinate system and design the 2D and 3D surfaces and solids.

CO2 Understand the various types of curves
CO3 Develop a part program using CNC Part Programming.
CO4 Analyze a part program using APT language.
CO5 Understand the applications of various CAPP techniques /methods

UNIT-I

Introduction : Introduction, Review of vectors & Matrices ,Basics of geometric and solid modeling, explicit, implicit, intrinsic and parametric equations, coordinate systems. Transformations : Introduction , Transformation of points & lines,2-D Translation , Shearing, Rotation, Reflection, Scaling & Combined Transformation, Homogeneous Co-ordinates,3-D Scaling, Shearing, Rotation , Reflection & Translation, Combined Transformation, orthographic, axonometric, oblique & perspective projections.

UNIT–II

Curves & Surfaces Geometry and topology ,Algebraic & geometric forms of straight lines, circle, Bezier curves & B–splines curves ,blending functions ,Re parametrization, plane surfaces, sixteen point forms ,four curves form, ruled surfaces of revolution, Tabulatedcylinder,loftedsurfaces,bi-cubicsurfaces,beziersurfaces,B-splinessurfaces, Coons patch.

UNIT–III

Introduction to CAM: Computer Hardware & Software , APT Language, Introduction to NC,CNC&DNC Systems, Machine axis and coordinate systems. CNC tooling Machine Tools. Automatic tool changers. Open loop and closed loop systems. Adaptive control encoders.

UNIT-IV

Manual part programming, CNC part programming, canned cycles, G-codes& M-codes.

High language programming: Flexible manufacturing systems, Computer aided process planning, and Automated Material handling.

Text Books:

1. CAD/CAM byM.P. Groover, PHI
2. CAD/CAM Theoryand Practice, Zeid
3. UnderstandingCAD/CAM byD.J.Bowman

ReferenceBook:

1. CAD/CAM Hand book, tiecholz
2. Computer Aided Manufacturing, P.N.Rao**.**

16MME21C3- I.C. ENGINES COMBUSTION AND POLLUTION

L	T	P	CREDIT	SESSIONAL:50 Marks
4	0	0	4	THEORY :100 Marks

TOTAL :150 Marks

DURATION OF EXAM.:3 Hrs.

Course Outcomes (CO): At the end of the course, the students will be able to:

CO1 Understand the basic features of 4s and 2s engines
CO2 Understand various combustion processes
CO3 Learn about various pollution contents

UNIT-I

Fuel air Cycles analysis, Thermodynamics of combustion, Chemical equilibrium, Dissociation, Combustion Charts and gas tables for air fuel mixtures and the products of Combustion. Types of Hydrocarbons in Petroleum fuels, Gasoline grades, required properties of SI and CI engine fuels. Rating of fuels.

UNIT-II

Definition of combustion, combustion modes and flame types, review of property relation, Law of thermodynamics, reactant and product mixtures adiabatic flame temperature, chemical equilibrium and product of combustion. Laminar premixed flame, definition principle characteristics, factors, Influencing flame velocity and thickness, flammability limit sand quenching of laminar flow, ignition, turbulent flames : turbulent flame propagation, flame stabilization

UNIT-III

Burning of carbon, coal combustion, effect of pollutant emissions from premixed combustion and from non-premixed combustion. Detonation, principle,characteristics one-dimensional, detonation velocity, structure of detonation waves.

UNIT-IV

Pollution : Exhaust gases and analysis, or set apparatus , infrared analyzer, determination of air fuel ratios, air pollution and engines.

TextBooks:

1. I.C engineVol.1&2byTaylor
2. Thermodynamics and Gas Dynamics of IC engines,Vol1&2byHorlockand Winterbone.

ReferenceBooks:

1. I.C engineVol1&2byBenson andWhitehouse.
2. Thermodynamics analysis of combustion engines, byCampbell

16MME21C4-MACHINETOOLDESIGN

L	T	P	CREDIT	SESSIONAL:50Marks
4	0	0	4	THEORY :100Marks

TOTAL :150Marks

DURATION OF EXAM.:3 Hrs.

UNIT I

Introduction to Machine Tools and Mechanisms :General principles of machine tool design, working and auxiliary motions ,machine tool drives hydraulic and mechanical transmission and its elements ,general requirements of machine tool design, layout of machine tools. Regulation of Speed and Feed Rates: Purpose, stepped regulation of speed-design of speed box ,machine tool drives using multiple speed motors ,developing the gearing diagram, step-less regulation of speed and feed rates.

UNIT-II

Machine Tool Structure: Functions and requirements, design criteria ,materials used and their properties, static and dynamic stiffness ,cross-sectional shapes used for machine tool structures and basic design procedure for the design of beds ,columns and other structural elements, model techniques used in design, introduction to Finite Element Method (FEM).

UNIT-III

Guide ways and Power Screws: Function and types , design considerations & procedure forslideways, design of powerscrews.

UNI-IV

Spindles and Spindle Supports: Functions and requirements, materials, effect of machine tool compliance on machining accuracy ,design of spindles, bearings design/selection. Control Systems :Functions ,requirements and classification, control systems for speeds, feeds & auxiliary motions ,manual control systems, automatic control systems ,adaptive control systems,criteria and economics election of machine tools, future trends in development ofmachine tools.

TextBook:

Machinetool design ByN.K.Mehta

Design ofMachineTool ByS.K.Basu

Course Outcomes (CO's): At the end of the course, the student shall be able to:
Understand the theories of chatter in machine tools.
CO1 - Analyze damping characteristics of machine tools.
CO2 - Analyze static and dynamic analysis of machine tools.
CO3 - Understand single and multidegree freedom system of machine tools.
CO4 - Understand chatter in machine tools

16MME21CL1- COMPUTER AIDED DESIGN & MANUFACTURING LAB

L	T	P	CREDIT	SESSIONAL/Class work:50Marks
0	0	4	2	Practical(external) :50 Marks

TOTAL :100 Marks

DURATION OF EXAM.:3 Hrs.

Course Outcomes (CO): At the end of the course, the students will be able to:

CO1. Understand the basic features of CNC Machining Centres and CNC Turning Centres

CO2. Understand the part programming of CNC Machining Centres and CNC Turning Centres through live demonstrations of machining examples

CO3. Learn the basics of Automatic Guided Vehicles (AGVs) and Robotics

CO4. Learn about the basic knowledge about Coordinate Measuring Machine (CMM) and Machine Vision System

LISTOFEXPERIMENTS

1. To create a 2-Dimensional Sketch with the help of all geometrical Shapes.
2. To list the coordinate of given diagram
3. To prepare apart programme for facing & turning operation on a CNC Lathe.
4. Prepare part programme for facing & taper turning operation on CNC Lathe in single cut programming in word address format.
5. To create solid of all solid entities of basic solid modeling commands.
6. Practice Boolean operation on solids.
7. Create surface with help of ruled & the tabulated surfaces.
8. Create a surface with the help of a surface of revolution & edge surface.

16MME21CL2 : I.C. ENGINES COMBUSTION & POLLUTION LAB

L T P 0
0 4

CREDIT(2)
Sessional : 50 Marks
Practical : 50 Marks
Total :100 Marks

Duration of Exam. : 3 Hrs.
List of Experiments :
Course Outcomes (CO): At the end of the course, the students will be able to:

CO1 Understand the basic features of 4s and 2s engines
CO2 Understand various combustion processes
CO3 Learn and analysis about various pollution contents

1. To study the constructional detail & working of two-stroke/ four stroke diesel engine.
2. Analysis of exhaust gases from single cylinder/multi cylinder diesel/petrol engine by Orsat Apparatus.
3. To prepare heat balance sheet on multi-cylinder diesel engine/petrol engine.
4. To find the indicated horse power (IHP) on multi-cylinder petrol engine/diesel engine by Morse Test.
5. To prepare variable speed performance test of a multi-cylinder/single cylinder petrol engine/diesel engine and prepare the curves (i) bhp, ihp,fhp, vs speed (ii) volumetric efficiency & indicated specific specific fuel consumption vs speed.
6. To find fhp of a multi- cylinder diesel engine/petrol engine by Willian's line method & by motoring method petrol engine.

Course Outcomes (CO): At the end of the course, the students will be able to:

CO1 Understand the basic features of 4s and 2s engines

CO2 Understand various combustion processes

CO3 Learn and analysis about various pollution contents

16MME21CL3 -MICRO MACHINING PROCESSES LAB

L	T	P	CREDIT	SESSIONAL:50 Marks
0	0	4	2	Practical :50 Marks

TOTAL :100 Marks

DURATION OF EXAM.:3 Hrs.

Course Outcomes (CO): At the end of the course, the students will be able to:

CO1 Understand the basic features of EDM . ECM.
CO2 Understand the basic feature of AJM, USM etc.
CO3 Learn the MRR of various micro machining process.

LISTOFEXPERIMENTS

1. Study and applications of Abrasive Jet Machining.
2. Study and applications ofElectrical DischargeM/C
3. Study and applications of Electrochemical Grinding
4. Study and applications of UltrasonicMachining
5. Study and applications ofElectrochemical Machining
6. Study and applications Jet Machining
7. Study and applications wire Electrical DischargeM/C

LIST OF SOFT CORE-I

16MME21D1 =NUMERICAL METHODS & COMPUTING

16MME21D2 =METHOD ENGINEERING & ERGONOMICS

16MME21D3 =COMPUTATIONAL FLUID DYNAMICS

16MME21D1-- NUMERICAL METHODS ANDCOMPUTING

L T P CREDIT **SESSIONAL:50 Marks**
4 0 0 4 **THEORY :100 Marks**
TOTAL :150Marks
DURATION OF EXAM.:3 Hrs.

Course Outcomes (COs): At the end of the course, the student shall be able to:
CO 1 – Analyse of Numerical solution of partial differential equations.
CO 2 – Solution to the linear simultaneous equations.
CO 3 – Expedite Numerical solution of ordinary differential equations.
CO 4 – Conceptualizations of optimization.

UNIT-1 ERRORS IN NUMERICALCALCULATIONS

Introduction. Numbers and their accuracy. Absolute. Relative and percentageerrors and theiranalysis General errorformula.

INERPOLATION AND CURVEFITTING

Taylor series and calculation of functions. Introduction to interpolation . Lagrange approximation .Newton polynomials. Chebyshev polynomials least squares fine. Curvefitting. Interpolation bysplinefunction

UNIT-2NUMERICALDEFFERENTIATION AND INTEGRATION Approximatingthe derivative. Numerical differentiation formulas .Introduction to Numerical quadrature. Newton-cores formula. Gausion quadrature.

SOLUTIONOFNONLINEAR EQUATIONS

Bracketing methods for locating eroor. Initial approximations and convergence criteria. Newton-Raphsen and secant methods .Solution of problems through astructural programminglanguagesuch as Corpascal.

UNIT-3SOLUTION OF LINEAR SYSTEMS

Direct Methods .Gaussian elimination and pivoting Matrix in version. UV factorization Iterative methods for linear problems through a structured programminglanguage such as Cor Pascal

.EIGEN VALUE PROBLEMS

Jacobi. Given's and Householder's methods for symmetric matrices. Rutishauser method for general matrices, power and inverse power methods solution of problems through a structured programming language such as CorPascal.

UNIT-4SOLUTIONOF DIFFERENTIAL EQUATIONS

Introduction to differential equations. Initial value problems. Euler's methods. Heun's method. Runge Kutta methods .Taylor series method. Predictor-corrector methods. Systems of differential equations.

Boundary

Valve problems. Finite-difference method. Solution of problems through a Structured programming language such as Cor Pascal.

PARTIAL DIFFERENTIAL EQUATIONS

Solution ofhyperbolic .Parabolic and elliptic equations .The eigen value problem the power method and theJacobi's method foreigen value problems. Solution of problems through a structured programming language such as CorPascal.

Text Books:

1. Applied NumericalAnalysis by Curtis E. Gerald andPatrick Q. Wheatley-publishedbyAdditionWesley.
2. AppliedNumericalMethods-carnahan.B.H.Luthar.H.A.andWilkes.J.O.Pub-j. Wiley.NewYork

ReferenceBooks:

1. Numerical Solution of Differential Equations. By M.K.Jain.publishedbyWiley Eastern.NewYork.
2. Introductory Methods of Numerical Analysis by S.D. Sastry. Published by Prentice Hall ofIndia.
3. NumericalMethods-Hornbeek.R.W.Pub-prenticeHall.EnglewoodCliffs.N.J.
4. Numerical Methods for Mathematics. Science and Engineering by John H.Mathews. PHI New Delhi

16MME21D2-METHOD ENGINEERINGANDERGONOMICS

L T P CREDIT **SESSIONAL:50 Marks**
4 0 0 4 **THEORY :100Marks**
TOTAL :150Marks
DURATION OF EXAM.:3 Hrs.

Course Outcomes (CO): The student will be able to:

CO1. Address issues related to productivity assessment and improvement.

CO2. Analyse the operations and using systematic approach to improving shop floor operations.

CO3. Use tools for analysis and design of operations.

CO4. Determine time standards and conditions of work.

CO5. Redesign layout of a shop floor.

UNIT-I

Introduction to industrial engineeringand productivity, measurement ofproductivity, Introduction to work study, methods studyprinciples and motion economy, Filming Techniques and micro-motion analysis,Introduction to work measurement.Timestudy, performance allowances,worksampling,

UNIT-II

Introduction of Ergonomics, system approach to ergonomic model, .Area of study covered under ergonomics , man/machine systems, characteristics of man machine system,limitationofman&machinewithrespecttoeachother.Designapproach:Work Design consideration,General principles forcarryingout thephysical activities,Design of workplace,machineat workplace,seat forworkplace.

UNIT-III

Controls: Criteriaforcontrol design, Hand controls and foot controls, Relationship between controls and displayinstruments, Controls for high precision work (Push Buttons, switches, knobs etc.),Layout ofpanels and machine
Displays:-Types ofdisplays, Design recommendation forquantitativedisplays.

UNIT-IV

Climates:-Heat Humidity-Fundamentals ofhuman thermal regulation, measuringthe thermal environment, work in hot climate, work in cold climate protection against climatic extremes, effect to climate on
performance.
Noise:- Terminology, physiological effects ofnoise, annoyanceofnoise, speed interference,hearingloss,temporaryand permanent threashold shift, effect ofnoiseon performancereduction ofnoise, personal noiseprotection.
Text Books:

1. Method Engineering study–Krick,S.V.
2. Work studyand Ergonics–Suresh Dalela, Saurabh.

Referencebooks:

1. IntroductionofErgonomics-Bridger-TataMcGrawHill1995
2. WorkStudy-Khanna–DhanpatRai&Sons-1995

16MME21D3-COMPUTATIONAL FLUID DYNAMICS

L T P CREDIT **SESSIONAL:50 Marks**
4 0 0 4 **THEORY :100 Marks**
TOTAL :150Marks
DURATION OF EXAM.:3 Hrs.

Course Outcomes (CLO): Upon completion of this course, the students will be able to:

CO1. Solve PDE.

CO2. Use Finite Difference and Finite Volume methods in CFD modeling

CO3. Generate and optimize the numerical mesh

CO4. Simulate simple CFD models and analyze its results.

UNIT-1 Introduction

History of CFD: Comparison of the three basic approaches in engineering problems solving analytical .Experimental and computational methods. Beam advance in computational techniques.

UNIT-II Problem formulation

The standard procedure for formulating a problem physical and mathematical classification of problems, types of governing differential equations.

Method s of Discretisation:

Basic of finite difference method: Finite element method. Finite volume method and spectral method. Treatment of boundary conditions.

UNIT-III

Numericalsolution of Heatconduction problems:

Steady-state problems: (i)Onedimensional heat conduction transfer through apin-fin- din, two dimensional conduction through aplateunsteadystateproblem: One dimensional transientat conduction. Explicit and implicit methods. Stabilityof numericalmethods.

UNIT-IV Numerical solution of fluid flow problems

Types of fluid flow and their governing equation: Viscous incompressible flows calculation of flow field using the stream function-vorticitymethod: calculation of boundarylayeroveraflat plate: Numerical algorithm forsolvingcompleteNavier-Stokes equation-MAC method SIMPLE algorithm:Project Problem.

Books recommended:

Numerical heat transfer and fluid flow bySuhas V.Patankar, taylor and francis.

Computational fluid dynamics byJ.Anderson

16MME22C1- WELDING AND ALLIED PROCESSES

L	T	P	CREDIT	SESSIONAL:50 Marks
4	0	0	4	THEORY :100Marks

TOTAL :150 Marks
DURATION OF EXAM.:3 Hrs

Course Outcomes

CO1 Students will understand the Basic classification of welding processes, weldability and solidification mechanism in welding bead.

CO2 Students would be able to understand the concept of arc initiation, role of electrode polarity on arc behavior, arc stability and analysis of the arc in welding.

CO3 Students would be able to understand the principles and processes of advance welding processes

CO4 Students will get familiar with Automatic welding, Flexible Automated Welding, Robotic welding, Robots and Robot Selection Mechanics in advance welding techniques.

UNIT 1.

Introduction :Basic classification of welding processes, weldability ,weld thermal cycle, metallurgy of fusion welds, solidification mechanism and micro structural products in weld metal ,epitaxial, cellular and dendritic solidification ,metallurgical changes in weld metal, phase transformation during cooling of weld metal in carbon and low alloy steel, prediction of microstructures and properties of weld metal .Heat affected zone ,re-crystallization and grain growth of HAZ gas metal reaction, effects of alloying elements on welding of ferrous metals.
Welding Arc: Arc efficiency ,temperature distribution in the arc; arc forces, arc blow, electrical characteristics of an arc, mechanism of arc initiation and maintenance, role of electrode polarity on arc behaviour and arc stability,analysis of the arc.
Types of electrodes, AWS and Indian system of classification and coding of covered electrode for mild steel,Shielding gases and associated mixtures

UNIT 2.

Metaltransfer: Short circuit/dip transfer. Free flight .Globular type .Spray type, Forces affecting metal transfer .Weld bead geometry and shape factors, Weld dilution.

Electric arc welding principle, MIG:- welding equipment and processes, shielding gas, types of

metal transfer .Tungsten inert gas arc welding(GTAW):-welding equipment ,electrodes ,inert gase sand torches. Submerged arc welding (SAW):-principle of processes, applications ,fluxes and welding electrodes used. CO2 welding:-difference from MIG welding, Principle of operation ,equipment, welding parameters and applications.

UNIT 3.

Solid state welding: Introduction, main features and applications of Ultrasonic welding, Friction welding, FRICTION STIR WELDING ,FRICTION STIR PROCESSING and Explosive welding.
Welding of plastics : Difficulties in welding of Plastics, Processes for welding of Plastics.

Surfacing and metal spraying: Surfacing methods such as SMAW, MIG, TIG, SAW. Thermal spraying: Introduction, Procedures, Applications,Advantages and Disadvantages.
Underwater Welding : Introduction, methods and applications.

UNIT4.

Automation in Welding : Introduction ,Semiautomatic welding, Automatic welding, Welding mechanization ,Flexible Automated Welding, Robotic welding, Types of Welding Robots, Selection Mechanics, Joint tracking system.

REFERENCE BOOKS

1. Welding processes & technology by Dr.R.S.Parmar Khanna Publishers
2. Welding Engineering & Technology by Dr.R.S.Parmar Khanna Publishers
3. Modern Arc Welding Technology by S.V.Nandkarni Oxford & IDH publishing Co. Principles of Welding Technology by L.M.Gourd ELBS/Edward Arnold
4. The Physics of welding by Lancaster; Pergaman Press.
5. The Metallurgy of welding by Lancster; George Allen & Unwin Ltd.U.K. Welding hand book,Vol.1&2,seventhedition;Americanweldingsociety. MetalHandbook,Vol6, 73;ASME
6. Procedure Hand book of ARC welding; Lincoln Electric Co. USA.
7. The Solid phase welding of metals by Tylecote; Edward Arnold Pvt. Ltd. Welding & Welding Technology Richard L.Little, Mc Graw Hill. Welding Technology by Rossi; McGraw Hill.

8. Welding Technology by Koenigsberger and Adaer;Macmillan.

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16MME22C2- TOTAL QUALITY MANAGEMENT

L	T	P	CREDIT	SESSIONAL:50 Marks
4	0	0	4	THEORY :100 Marks

TOTAL :150 Marks

DURATION OF EXAM.:3 Hrs.

Course Outcomes

CO1 Students will understand the concepts of quality, quality assurance and management.

CO2 Students would be able to understand the concept of TQM.TQM perspectives and strategies

CO3 Students would be able to understand the methods of statistical process control and TQM tools.

CO4 Students will get familiar with quality awards, quality standards, ISO9000,EMS14001.

UNIT1.

1. **TQM Perspective and TQM Implementation:**
   Quality, Chain Reaction, Dimensions of Quality,Evolution Of Quality,Quality Control,Quality Assurance ,Quality Planning, Quality Improvement, Quality Management, Total Quality Management, Cost Of Quality, Classification of Failure Cost, Reducing Costs,Juran's Model Of Optimum Quality Costs,Analysis of COQ For Improvement,Analysis Of External Nd Internal Failure Costs,TQM,Elements Of TQM,Leadership For TQM, Demings 14 Points For Top Management,TQM Tools And Techniques, PDSA,Barriers For TQM Implementation

UNIT 2.

2. **TQM principles and Strategies:**
   Customer Satisfaction & Employee Involvement.
   Service Quality, Features Of Services,The Kano Model ,Employee Motivation,Motivation Theory Of Individual Employees,Effective Communications,Training And Mentoring,Recognition And Reward.
   Continuous Process Improvement and Process Approach.
   Juran'sTriology,Kaizan,PDCA,Seven Quality Tools,BPR,Seven Deadly Wastes,ETXModel,LeanManufacturing,KanbanSystem,CellularManufacturing,Single Piece Flow,Zero Defects

UNIT3.

3. **Statistical Process Control & TQM Tools**
   The Seven Quality Control Tools, Standard Normal Distribution,AQL,Seven Management Tools,Benchmarking,QFD,Taguchi'sDesign,TPM,FMEA

Unit 4.

4. **Quality Systems**
   ISO9000 standard, EMS14001, Quality Awards

5. Supplier Partnership and Performance Measures-

   Importance Of Suppliers, Selection And Standards, Quality Audit, Product Audit, Vendor Rating System, PDCA For Measurements, Performance Measure Design, BSC.

REFERENCEBOOKS:

1. "Total QualityManagement "byOakland (Butter worth- HeinamannLtd.)

2. "Managingfortotal qualityfrom Demingto Taguchi and SPC"byLogothetis N.(PHI)
3. "Total QualityControl"byFeigenbaumA.V.(MGH)
4. "Total QualityManagement"byBesterfieldDale H (Pearson Education)
5. "A slicebyslice guideto TQM"byJohn Gilbert(Affiliated East West Press).
6. "TheTQM tool kit-aguideto practical techniques forTQM"byWallerJenny, Allen Derek and BurnaAndrew (KoganPage)

16MME22CL1-MECHATRONICS LAB

L	T	P	CREDIT	SESSIONAL:50 Marks
0	0	4	2	Practical :50Marks

TOTAL :100 Marks
DURATION OF EXAM.:3 Hrs.

Course Outcomes (CO's): At the end of the course, the student shall be able to:
CO1 Understand the various practical demonstrations of mechatronics.
CO2 To utilize the theories for designing digital system.
CO3 Selection of equipments and practical demonstration.
CO4 Prepare computer programme based on mathematical model

1. Study of sensor &Transducers.
2. Study of operational Amplifier
3. Study of Pneumatic & Hydraulic System
4. Study of Mechanical System
5. Study of Computer &Microprocessor equipments
6. Study of Programmable controller

16MME22CL2- ADVANCED WELDINGLAB

L T P CREDIT **SESSIONAL:50 Marks**
0 0 4 2 **Practical :50Marks**
TOTAL :100 Marks
DURATION OF EXAM.:3 Hrs.

Course Outcomes

Students would be able

CO1 To understand about the industrial applications of welding techniques.

CO2 To understand about the basics and working principle of different welding processes.

CO3 Identify and study Tensile property, Bead Geometry, Hardness of Bead, Micro structure of welding bead in case of different welding processes

CO4 To analyze mechanical behavior of different advance welding processes.

CO5 To learn about the advantages, disadvantages and industrial application of welding techniques in different conditions.

LIST OF EXPERIMENTS IN WELDING

1. To study Heat flow in Welding (Equipment

for use-Gas Welding equipment)

2. To study tensile property, wear characteristics , Bead Geometry, Hardness of Bead ,Microstructure and fatigue behaviour of welding Bead in case of:

i) MIG Welding ii) TIG Welding

iii) SAW Welding iv) Arc welding

3 To study mechanical behaviour(tensile strength Hardness of Bead, Micro structure of welding Bead ,impact strength ,corrosion and wear ,fatigue behaviour)in case of.

1. Friction stir welding
2. Friction stir processing

LIST OFELECTIVE-II

16MME22D1 =MODELING & SIMULATION

16MME22D2 =JIGS & FIXTURE

16MME22D3 =TOOL & DIE DESIGN

16MME22D1-MODELLING&SIMULATION

L	T	P	CREDIT	
4	0	0	4	

SESSIONAL:50Marks
THEORY :100Marks
TOTAL :150Marks
DURATION OF EXAM.:3 Hrs.

Course Outcomes: After completion of this course the student will be able to

CO1 Understand the important physical phenomena from the problem statement

CO2 Develop model equations for the given system

CO3 Demonstrate the model solving ability for various processes/unit operations

CO4 Demonstrate the ability to use a process simulation

UNIT-I

Concept of system system environment ,elements of system,system modelling, types of models, MonteCarlo method .System simulation-a management laboratory, advantages &limitations of system simulation ,continuous & discrete
systems.

UNIT-II

Simulation of Continuous systems : Characteristics of a continuous system, comparison of numerical integration with continuous simulation system. Simulation of an integration formation.

Simulation of discrete systems: Time flow mechanisms, discrete and continuous probability density functions, Generation of and from numbers, testing for and omnes sand forauto correlation, generation ofrandom variants fordiscretedistribution.

UNIT-III

Simulation of Queuing system: Concept of queuing theory, characteristics of queues, stationary &time dependent queues ,Queue discipline, time series analysis ,measure of system performance ,kendal' s notation, simulation of singles ever queues multi-server queues.

Simulation of inventory systems : Rudiments of inventory theory ,MRP, in process inventory, necessity of simulation I inventory problems, forecasting &regression analysis, forecastingthrough simulation.

UNIT-IV

Design of simulation experiments: Length of run ,elimination of initial bias, variance reduction techniques ,stratified sampling ,antipathetic sampling ,common random numbers.

Simulation languages: Continuous & discrete simulation languages ,block structure, continuous languages ,special purpose simulation languages ,SIMSCRIPT,GPSS, SIMULA,importance& limitation ofspecialpurposelanguages.

Text Books:

1. System simulation byGordon
2. System simulation byHira

16MME22D2-JIGSAND FIXTURES

L T P CREDIT **SESSIONAL:50 Marks**
4 0 0 4 **THEORY :100Marks**
TOTAL :150Marks
DURATION OF EXAM.:3 Hrs.

COURSE OUTCOMES: Upon completion of this course

CO1 Student will be able to understand appropriate technique to a specific requirement.

CO2 Student will be able to understand different jigs and fixtures and design

CO3 Student will be able to understand different press and cutting dies machining processes.

CO4 Student will be able to understand different bending, drawing and forming dies and design

CO5 Student will be able to understand different forming dies and design

UNIT-I

Degree of freedom &Restrain, Location methods, Design of guidepins & dowel pins, Location of irregular geometrical product ,Calculation of forces &Torque exerted by machining methods.

UNIT-II

Purpose types and functions ofjigs and fixtures ,Tool design objectives-Production devices-Inspection devices-Materials used in Jigs and Fixtures–Types ofJigs-Types of Fixtures-Mechanical actuation-pneumatic and hydraulic actuation-Analysis ofclamping force-Tolerance and error analysis.

UNIT-III

Jigs ,Drill bushes –different types of jigs –plate latch, channel, box post ,angle plate, angular post, ,pot jigs-Automatic drill jigs-Rack and pinion operated .Air operated Jigs components .Design and development of jigs forgiven components.

UNIT-IV

Fixtures for machining and inspection, General principles of boring, lathe, milling and broaching fixtures-Grinding, planning and Shaping fixtures, assembly, Inspection and welding fixtures-Modular fixtures .Design and development of fixtures forgiven component.

Text Books:

1.EdwardGHoffman,"Jigs&FixtureDesign",Thomson – DelmarLearning,5004 2.Donaldson.C,"ToolDesign",TataMcGraw-Hill,1986

ReferenceBooks:

1.Kempster,"Jigs &Fixtures Design",TheEnglish Language Book Society,1978

2.Joshi,P.H.,“Jigs &Fixtures”,Second Edition,TataMcGraw-Hill Publishing CompanyLimited,5004
3.Hiram E Grant,“JigsandFixture”,TataMcGraw-Hill,5003
4.“Fundamentals ofToolDesign”,CEEEEdition,ASTME,1983 5.PSG Collegeof Technology, Coimbatore–Design DataHand book

16MME22D3-TOOL AND DIE DESIGN

L T P CREDIT **SESSIONAL:50 Marks**
4 0 0 4 **THEORY :100Marks**
TOTAL :150Marks
DURATION OF EXAM.:3 Hrs.

Course Outcomes:

CO1 Design of new concepts of manufacturing methods

CO2 Use of various forming methods for making heavy duty products

CO3 Automation of various elements for industries applications

CO4 Methods designed for mass production

UNIT-I

Tools Materials and their heat treatment, Mechanism and geometry of chip formation, effect of large and smalls hear angles on chip thickness and length of shear planes study of cutting forces, friction forces ,means hear strength coefficient of for cutting, method of calculating the metal remove rate. Influence of rake angle side cutting edge & nose radius on cutting forces. Relationship between temperature and hardness of cutting tool materials, Tool geometry of single point and Multipoint Cutting Tool

UNIT-II

Press working terminologies and elements of dies and strip lay out, Press working terminology-Presses and press accessories-Computation ofcapacitiesandtonnagerequirements.Elementsofprogressivecombinationandcompounddies: Die block dieshoe. Bolster plate-punch plate-punch holder-guide pins and bushes– strippers– knockouts-stops–pilots-Selection of standard die sets

Strip layout-strip layout calculations.

UNIT-III

Design and development of dies, Design and development of progressive and compound dies for Blanking and piercing ,operations .Bending dies–development of bending dies-forming and drawing dies-Development of drawing dies. Design considerations in forging, extrusion, Casting and Plastic dies

UNIT-IV

Plastic as a tooling material, commonly used plastic for tooling material, application of epoxyplastic tools ,Construction methods of plastic tooling ,Metal forming operation with Urethanedies. Calculating forces for Urethane pressure pads.

TextBooks:

1.Tool Design byCyril Donation, GeorgeH.Lecain,VC Goold.
2. Edward GHoffman,"Jigs &FixtureDesign",Thomson –Delmar Learning,5004
3.Donaldson.C, "Tool Design",TataMc Graw-Hill,1986

ReferenceBooks:

1. Kempster,"Jigs & Fixtures Design",TheEnglishLanguageBookSociety,1978

2. Joshi,P.H.,"Jigs&Fixtures",Second Edition,TataMcGraw-Hill Publishing CompanyLimited,5004
3. Hiram E Grant,"Jigsand Fixture",TataMcGraw-Hill,5003
4. "Fundamentals of Tool Design",CEEE Edition, ASTME, 1983
5. PSGCollegeofTechnology, Coimbatore-Design DataHand book

M.D UNIVERSITY

SCHEME OF STUDIES AND EXAMINATION

M.TECH 2nd YEAR (MECHANICAL ENGINEERING)

SEMESTER 3rd

CBCS Scheme effective from 2017-18

Sl. No	Course No.	Subject	Teaching Schedule				Examination Schedule (Marks)				Duration of Exam (Hours)	No of hours/ week
			L	T	P	Total credits	Marks of Class works	Theory	Practical	Total		
1	17MME23C1	Tribology & Maintenance Engineering	4	0	-	4	50	100	-	150	**3**	**4**
2	17MME23C2	Robotics and Automation	4	0	-	4	50	100	-	150	**3**	**4**
3	17MME23C3	Major Project (Dissertation Stage 1)	-	-	4	4	100	-	-	100		**4**
4	17MME23CL1	Tribology & Maintenance	-	-	2	2	50	-	50	100		**2**

		Engineering Lab										
5		Open Elective				3						
		TOTAL				**19**						

NOTE:

Examiner will set nine questions in total. Question One will be compulsory and will comprises of all sections and remaining eight questions to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

OPEN ELECTIVE

A candidate has to select this paper from the pool of open electives provided by the University.

M.D UNIVERSITY

SCHEME OF STUDIES AND EXAMINATION

M.TECH 2nd YEAR (MECHANICAL ENGINEERING)

SEMESTER 4th

CBCS Scheme effective from 2017-18

Sl. No	Course No.	Subject	Teaching Schedule				Examination Schedule (Marks)				No of Credits
			L	T	P	Total	Marks of Class works	Theory	Practical	Total	
1.	17MME24C1	Major Project (Dissertation Stage 2)	-	-	-	-	250	-	500	750	**20**
		TOTAL	**-**	**-**	**-**	**-**	**250**	**-**	**500**	**750**	

NOTE:

1. **Students have to publish a research paper in a journal / conference of the research work done in the semester.**

17MME23C1 TRIBOLOGY & MAINTENANCE ENGINEERING

L	T	P	CREDIT	
4	0	0	4	

SESSIONAL:50 Marks
THEORY :100 Marks
TOTAL :150 Marks
DURATION OF EXAM. :3 Hrs.

Course Outcomes (CO): The students will be able to:

CO1. identify the properties of lubricants used in different bearings.

CO2. predict the different wears and causes of friction in different bearings.

CO3. analyze hydrodynamic lubrication for short and long bearing.

CO4. Management of maintenance activities.

CO5. monitor different conditions like leakage and vibration

UNIT-1

Engineering Tribology

Tribological system, Tribology in industries, friction and wear, lubricants and lubrication, fundamental of bearings, nano Tribology ,Introduction part of friction, theories of friction, adhesion theory of friction and its drawbacks, stick-slip theory of friction, friction measurement methods.

Unit-2

Wear, lubricants and bearings

Cause, effect, classification and mechanism of wear, quantitative laws of wear, wear and wear rate, objective and properties of lubricants, synthetic lubricants, reasons of degradation of lubricating oils ,lubricant additives, boundary lubrication, hydrodynamic lubrication, mechanism of elastohydrodynamic lubrication, classification of bearings, hydrostatic bearings, hydrodynamic bearings

UNIT-3

Maintenance Management

Relevance of maintenance, maintenance: an over view, maintenance services, problems of the plant manager, automation and maintenance, maintenance objectives and costs, quality and quality circle in maintenance, Engineering reliability, maintainability Maintenance Types/sytems

Planned and unplanned maintenance, breakdown, corrective, opportunistic, routine, preventive, predictive, CBM, Design out maintenance

Unit -4

Condition monitoring

NDT concepts, visual and temperarture monitoring, leakage monitoring, vibration monitoring, lubricant monitoring-methods, equipments, ferrography, spectroscopy, cracks monitoring, thickness monitoring, corrosion monitoing.

Books:

Engineering Tribology by Choudhary

Maintenance planning and control- Kelly, A. Buttersworth & Co. 1984

Maintenance and spare parts Management – Krishanan G, Prentice Hall – 1991

17MME23CL1 TRIBOLOGY & MAINTENANCE ENGINEERING LAB

L	T	P	CREDIT	
0	0	3	1.5	

Sessional:50 Marks

Practical :100 Marks

Total :100 Marks

Duration of Exam. :3 Hrs.

Course Outcomes (CO): The students will be able to:

CO1. Study and perform non destructive testing techniques

CO2. Study and perform current testing and ultrasonic testing.

CO3. Study and perform pin and wear disc apparatus.

CO4. Study wear, lubricants and bearings.

List of Experiments.

1. To study the introduction to maintenance techniques. preventive and predictive Maintenance
2. To study and perform Non-Destructive Testing techniques , liquid dye penetrant and leak testing.
3. To study and perform Eddy current testing & Ultrasonic testing .
4. To study and perform Magnetic particle detection and Particle counter.
5. To study wear Analysis through thermography and Ferrography.
6. To study and perform Pin on wear disc apparatus
7. To study wear, lubricants and bearings
8. to study and perform on Journal bearing apparatus,hudrodynamic and hydrostatic bearing apparatus.

17MME23C2 ROBOTICS AND AUTOMATION

L	T	P
4	0	0

Course Outcomes (CO's): At the end of the course, the student shall be able to:

CO1 Understand the robotic automation strategies.

CO2 Analyze dynamics of robot manipulator.

CO3 Task programming of robots.

CO4 Understand vision and sensing characteristics of robots.

CO5 General design consideration on trajectories motion of robots

UNIT-1

Introduction to Robot Technology: Robot Physical configuration, basic Robot motions.

Types of Manipulators: Constructional features, advantages and disadvantages of various kinematic structures, servo and Non- servo manipulator. Actuators and Transmission System: Pneumatic, Hydraulic and Electrical actuators and their characteristics and control systems. Feed Back Systems and Sensors: Encoders and other feed back systems, vision, ranging systems, textile sensors.

UNIT-2

Programming Languages: Description of VAN, RAII and other Languages. Artificial Intelligence: Logged Locomotion, Export system.Concept of spatial description and transformations, manipulator Kinematics; Inverse manipulator, Kinematics Jacobians; velocities and static forces; manipulator dynamics, position control of manipulators, force control of manipulators, robot programming languages and systems. Concept of automation in Industry, mechanisation and automation classification of automation systems.

UNIT-3

Air Cylinders- their design and mountings, pneumatic and hydraulic valves, flow control valves metering valves, direction control valves, hydraulic servo systems, pneumatic safety and remote control circuits.

UNIT-4

Basis of Automated work piece handling: Working principles and techniques, job orienting and feeding devices. Transfer mechanisms automated feed out of components, performance analysis.

Assembly automation, automatic packaging and automatic Inspection.

Books:

CAD/CAM by Groover and Elimmers (Jr.) CAD/CAM Handbook, Bed ford Masschusettes.

Automation Production Systems & Computer Aided Manufacturing. Robotics for Engineers by Royen MIT Press.

Robot Manipulators by Paul MIT Press. Robotics by Hall & Hall.

Robot Motion by Brady MIT Press.

Numerical Controlled Computer Aided manufacturing by Press man and Elimmers, John Wiley & sons. New York.

17MME23C3 **MAJOR PROJECT**

(DISSERTATION STAGE-1)

Marks Credits -4

L	T	P	
-		4	Sessional Exam : 100

A candidate has to prepare a report covering identification of research topic, literature review, planning of research scheme and systematic documentation. The marks will be given on the basis of a report prepared and presentation given by the candidate covering the above said contents, contents of the presentation, communication and presentation skills.

COURSE OUTCOMES:

By the end of this course every student is expected to be able to

CO1 understand the process of research.

CO2 do literature survey to identify a research problem.

CO3 communicate and discuss research ideas.

CO4 plan and write dissertation synopsis.

17MME24C1 DISSERTATION-II (IV sem)

COURSE OUTCOMES:

By the end of this course every student is expected to be able to

CO1 handle research problems and use modern research tools/methods.

CO2 analyse and review the existing literature on a research problem.

CO3 design and conduct experiments.

CO4 write dissertation and technical reports.

CO5 publish research papers.