M.D.UNIVERSITY, ROHTAK
SCHEME OF STUDIES AND EXAMINATION
M.TECH 1st YEAR (MANUFACTURING & AUTOMATION)
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	MTMA21C1	Metal Forming Analysis	4	0	-	4	50	100	-	150	3	4
2	MTMA21C2	Mechatronics & Product Design	4	0	-	4	50	100	-	150	3	4
3	MTMA21C3	Total Quality Management	4	0	-	4	50	100	-	150	3	4
4	MTMA21C4	Welding & Allied Processes	4	0	-	4	50	100	-	150	3	4
5	MTMA21C5	Mechatronics Lab	-	-	2	2	50	100	-	150	3	4
6	MTMA21C6	Welding Lab	-	-	2	2	50		50	100	3	4
7	MTMA21C7	CAD/CAM Lab	-	-	2	2	50		50	100	3	4
8	MTMA21C8	Seminar	-		-	2	50	-	-	50		2
9	MTMA21D1 or MTMA21D2 or MTMA21D3 OR MTMA21D4	Elective I	4	-		4	50	100		150	3	4
		TOTAL	**28**									

Elective I: Choose any one from the following three papers:
MTMA21D1 - INDUSTRIAL INSPECTION
MTMA21D2 - DESIGN AND METALLURGY OF WELDED JOINTS
MTMA21D3 - FOUNDARY TECHNOLOGY
MTMA21D4-DESIGN PLANNING CONTORL AND PRODUCTION SYSTEM

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.

M.D.UNIVERSITY, ROHTAK
SCHEME OF STUDIES AND EXAMINATION
M.TECH 1st YEAR (MANUFACTURING & AUTOMATION)
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	MTMA22C1	Mechanical Design-I	4	0	-	4	50	100	-	150	3	4
2	MTMA22C2	Diagnostic Maintenance & Monitoring	4	0	-	4	50	100	-	150	3	4
3	MTMA22C3	Seminar	-		-	2	50	-	-	50		2
4	MTMA22C4	CIM Lab	-	-	2	2	50	-	50	100	3	4
5	MTMA22C5	Diagnostic Maintenance & Monitoring Lab	-	-	2	2	50	-	50	100	3	4
6	MTMA22D1 or MTMA22D2 or MTMA22D3 or MTMA22D4	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:

MTMA22D1 - QUALITY CONTROL TECHNIQUES
MTMA22D2 - FINITE ELEMENT METHODS
MTMA22D3 - ARTIFICIAL INTELLEGENCE IN MANUFACTURING

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.

MTMA21C1- METALFORMINGANALYSIS

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

Unit 1

Stress-StrainrelationsinElasticandplasticDeformations ,True stress and true strain,true stress-straincurves,selectionof stress-straincurvesfor cold and hotworking,yield of isotropicplastic material,yieldcriteria.Trescamaximumsheer-strain-energycriterion,plasticincompressibility,Poisson'sratioforplasticdeformationflowrule, applicationoftheory ofplasticity forsolvingmetal formingproblemsusingSlabmethod,Upper andlowerBound methods,Sliplinefieldtheory.

Unit 2

Technologyandanalysisofimportantmetalformingprocesses-Forging,Roiling,Extrusion.Wiredrawing,SheetMetalforming processeslikeDeepdrawing,Stretchforming,Bending,defectsinvariousmetal formingprocesseslikerolling,forging,extrusion,wiredrawinganddeepdrawingandtheircauses andremedialmeasures,Effectsoftemperatureand strainratein metalworking,friction andlubricationinHotandColdworking.

Unit 3

Lubricationinmetal formingprocesses,principlesandmechanismoflubrications,hydrodynamicand theirfilmlubrication,boundary andextremepressurelubricants,solidlubricants,lubricantsusedfor rollingandcolddrawing,forging,

Unit 4

Applicationof FiniteElementMethodstoMetalForming Processes-special Discretization,Shapefunction,Stiffness matricesandtheir assembly,Implicitandexplicit formulations, Elasto-plasticapproximations,LagrangianVsEularianschemes, Materialintegrationschemes,auxiliaryequationsfor contact, frictionandincompressibility, Thermo-mechanicalproblem formulation

REFERENCEBOOKS:

1. MetalFormingAnalysis-R.H.Wagoner,CambridgeUniversityPress.
2. Theory ofElasticity-Dallyand Riley
3. MechanicalMetallurgy-Dieter, McGrawHillInc.
4.AnIntroductiontothePrinciplesofMetalworkingbyRowe,Arnold.
5. MetalforminganalysisbyAvitzer,Mcgrawhill.

MTMA21C2-MECHATRONICS& PRODUCT DESIGN

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

Unit 1

IntroductiontoMechatronicssystemsandcomponents, Principlesofbasicelectronics-Digitallogic,numbersystemlogic gates,Sequencelogicflipflopsystem,JKflipflop,D-flipflop. Microprocessorsandtheirapplications-Microcomputercomputer structure/rnicrocontrolles,Integratedcircuits-signalconditioning processes, various typesof amplifiers, lowpassand high pass filters.

Unit 2

Sensors-sensorsandtransducers. Displacement,position proximity sensors,velocity,forcesensors.Fluidpressure temperature,liquidlevelandlightsensors.Selectionofsensors.,Actuators,Pneumaticandhydraulic systems,Mechanical actuationsystem.Electricalactuationsystem.Other Electrical/ ElectronichardwareinMechatronicsystem.

Unit 3

Principles of Electronicsystem communication,Interfacing, A.D.andD.A.converters.Softwareandhardwareprinciplesand toolstobuildmechatronic systems.,Basicsystemmodels mathematicalmodels,mechanicalandother system Building blocks.
Systemmodels-Engg.Systems,rotational,translation,elected mechanical,Hydraulic mechanicalsystem.,SystemTransfer functions.First-secondorder systeminseries

Unit 4.

DesignandselectionofMechatronicssystemsnamelysensors lineencodersandrevolvers, stepperandservomotorsBall screws,solenoids,lineactuatorsandcontrollerswithapplication to CNC system,robots,consumerelectronicsproductsetc, DesignofaMechatronicProductusingavailablesoftwareCAD packagesMATLABandSIMULINK

REFERENCEBOOKS:

1. MechatronicsbyW.Bolton,publishedbyAddisonWorleyLongmanPvt.Ltd.,IndiaBrander,Delhi.
2. Automation ProductionSystemSystemandCIMSbyMikel PGrooer,PhenticeHallofIndiaPvt.Ltd,NewDelhi.
3. ProductionSystemsandCIM,Groover,PHI.
4. FlexibleManufacturingsystems,byMaleki,Prentic Hall.

MTMA21C3- 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.

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,ETX Model,Lean Manufacturing,Kanban System,Cellular Manufacturing,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's Design,TPM,FMEA

Unit 4

4. **Quality Systems**
   ISO9000 standard, EMS14001, Quality Awards
   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. "TotalQuality Management"byOakland (Butterworth- HeinamannLtd.)
2. "ManagingfortotalqualityfromDemingtoTaguchiandSPC"byLogothetis N.(PHI)
3. "TotalQualityControl" byFeigenbaumA.V.(MGH)
4. "TotalQuality Management"by BesterfieldDale H (PearsonEducation)
5. "AslicebysliceguidetoTQM"byJohnGilbert(AffiliatedEastWestPress).
6. "TheTQMtoolkit-aguidetopracticaltechniquesforTQM" byWallerJenny, Allen DerekandBurnaAndrew (KoganPage

MTMA21C4- WELDINGANDALLIEDPROCESSES

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

Unit 1

Introduction: Basicclassificationofweldingprocesses,weldability,weldthermalcycle,metallurgy offusionwelds,solidification mechanismandmicrostructuralproducts inweldmetal,epitaxial, cellular and dendritic solidification,metallurgical changes in weld metal, phase transformation duringcoolingofweldmetal incarbonandlowalloysteel,predictionofmicrostructuresand propertiesofweldmetal.Heataffectedzone,re-crystallization andgraingrowthofHAZ,gasmetal reaction,effectsofalloyingelementsonweldingofferrousmetals.

Unit 2

WeldingArc:Arcefficiency,temperaturedistributioninthearc;arcforces,arcblow,electrical characteristicsofanarc,mechanismofarcinitiationandmaintenance,roleofelectrodepolarityon arcbehaviourand arcstability,analysisofthearc.

Types ofelectrodes,AWSand Indiansystemofclassificationandcodingofcoveredelectrode formildsteel,Shieldinggasesandassociatedmixtures

Unit 3

Metaltransfer: Short circuit/dip transfer. Free flight.Globular type.Spraytype,Forces affectingmetal transfer.Weldbead geometryandshapefactors,Welddilution.

Electricarcweldingprinciple,MIG:-

weldingequipmentandprocesses,shieldinggas,typesofmetal transfer.Tungsteninertgasarc welding(GTAW):-welding equipment,electrodes,inertgasesandtorches.Submergedarc welding(SAW):-principleofprocesses,applications,fluxesand

weldingelectrodesused.CO_2welding:-

differencefromMIGwelding,Principleofoperation,equipment,weldingparameters andapplications.

Unit 4

Solidstatewelding: Introduction,mainfeaturesandapplications

ofUltrasonicwelding,FrictionweldingandExplosivewelding.friction stir processing and welding.

Weldingofplastics: DifficultiesinweldingofPlastics, Processes forweldingofPlastics.

UnderwaterWelding: Introduction,methodsandapplications.

AutomationinWelding: Introduction,Semiautomaticwelding,

Automaticwelding,Weldingmechanization,FlexibleAutomated

Welding,Roboticwelding,TypesofWelding Robots,Robot SelectionMechanics,Jointtrackingsystem.

REFERENCE BOOKS

1. Weldingprocesses&technologybyDr.R.S.ParmarKhannaPublishers
2. WeldingEngineering&TechnologybyDr.R.S.ParmarKhannaPublishers
3. ModernArc WeldingTechnologybyS.V.NandkarniOxford&IDHpublishingCo. Principlesof WeldingTechnologybyL.M.GourdELBS/EdwardArnold
4. ThePhysicsof weldingbyLancaster;PergamanPress.
5. TheMetallurgyofweldingbyLancster;GeorgeAllen&UnwinLtd.U.K. Weldinghandbook,Vol.1&2,seventhedition;Americanweldingsociety. MetalHandbook,Vol6, 73;ASME
6. ProcedureHandbookof ARCwelding;LincolnElectricCo.USA.
7. TheSolidphaseweldingofmetalsbyTylecote;EdwardArnoldPvt.Ltd. Welding&WeldingTechnologyRichardL.Little,McGrawHill. WeldingTechnologybyRossi;McGrawHill.
8. WeldingTechnologybyKoenigsbergerandAdaer;Macmillan.

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MTMA 21C5- MECHATRONICSLAB

L T P CREDIT **SESSIONAL:50 Marks**
0 0 3 2THEORY :100Marks
TOTAL :150 Marks
DURATION OF EXAM.:3 Hrs.

1. To verify truth table of various gatessuch asAND,OR,NOR.NOT,etc
2. To realize a logic equation Y=AB+CD
3. SelectionofsensorforaparticularapplicationfromCatalogue/ Internet.
4. Designamechatronicsproduct/systemandincorporate applicationof mechatronics for enhancing product values
5 Tostudythehardware'sandsoftwaresofmechatronicskit.
6 Tomove a table in X-direction within the rangeof proximity sensors usingControl-X software.
7 TorotateatableusingDACsystem.
8 Tomove a table in Y-direction within the rangeof proximity sensors usingControl-X software.
9 TorunamotorwithPLC.
10Torunaconveyorwithcomputer.
11Tostudythemovementofactuatingcylindersandsensors.
12TostudymechatronicsandtheirinterfacinginaCNC machine.
13 Lifepredictionfromcomputerprogrammebasedon mathematicalmodel.

MTMA21C6- WELDINGLAB

L T P CREDIT **SESSIONAL:50 Marks**
0 0 3 2THEORY :100 Marks
TOTAL :150 Marks
DURATION OF EXAM.:3 Hrs.

LIST OF EXPERIMENTS IN WELDING

1. TostudyHeatflowinWelding

(Equipmentforuse-GasWeldingequipment)

2. Tostudy tensile property,BeadGeometry,HardnessofBead,Microstructure ofweldingBeadincaseof:

i) MIGWelding ii) TIGWelding

iii) SAWWelding 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

MTMA21C7- CAD/CAM LAB

L T P CREDIT **SESSIONAL:50 Marks**
0 0 3 2THEORY :100 Marks
TOTAL :150 Marks
DURATION OF EXAM.:3 Hrs.

SECTION-I

1. DevelopageneralpurposecodetocanyouttheRotationofanobjectaboutanaxispassingthroughtwopoints
2. Developageneralpurposecodetocarryout
   i) anOrthographicprojection
   ii) Dimetricprojection,givenforeshorteningfactorFz
   iii) AnIsometricprojection·
   iv) APerspectiveProjectiongivenZc,IT
3. Developgeneralpurposecode,giventwoarbitraryprojections andthe respectivetransformationmatricesandthereconstructedcoordinatesoftheverticesoftheObject.
4. DevelopageneralpurposecodetocarryouttheReflection ofanObjectaboutanarbitraryplanepassingthroughThreepoints.

SECTION-II

1. Developageneralpurposecodeforintegrated
i) CubicSplinewithDifferentBoundaryconditions
ii) Beziercurve
iii)B-spline-itsVarioustypesand BestFitB-spline. Given:
a)CoordinatesoftheControlPoints
b)Boundaryconditions,ifany.
c)Orderofthecurve,ifrequired,andMatchtheouttoprojectedimageofanyCAD/CAMpackage.

SECTION-III

1. DevelopanoptimizedToolPathforEconomicMachiningand generatethe samein GUI(IDEAS/PRO-E/anyCAD software)forinterpretation
2. StudyofGraphicsFormatsandConversionfromoneformat toanother
3. GeneratetheMeshingoftheCONICALCylindricalSurface (apartofstepped cylindricalsurface) usinganysimulation Package
4. StudyofOpenGLprogrammingforthecustomizationofanyCADpackage
5. Developmentoffollowingsurfacepatches
   i) BilinearCoonsPatch
   ii) Tensor ProductBezierSurface

SECTION-IV

1. SolidModelling Exercisesusingany CAD/CAMpackage. (fromagivenlistof10Tutorials)
2. Generativemachininginterpretationforvarioustoolpathsfor machiningofCurvedsurfaces.

List of Soft Core –I

MTMA21D1- INDUSTRIAL INSPECTION
MTMA21D2- DESIGN AND METALLURGY OF WELDED JOINTS
MTMA21D3- FOUNDARY TECHNOLOGY
MTMA21D4- DESIGN, PLANNING AND CONTROL OF PRODUCTION SYSTEMS

MTMA21D1: INDUSTRIAL INSPECTION

L T P Sessional : 50 Marks
4 0 0 Theory : 100 Marks
Total : 150 Marks
Duration of Exam : 3 Hrs

UNIT1.

Design consideration for Gauges and measuring instruments: material selection for gauges, hardness and surface finish, tolerance for linear and dimensional chains, limits, fits and tolerance as per Indian and international standards, design of plug gauge, snap gauge, center distance gauge

UNIT2.

Inspection of threads and gears : thread gauge design, thread size measurement by two wire and three wire methods, vernier gear tooth gauge design.

UNIT3

Surface textures: components of machined surface texture, specification of surface texture, surface roughness measuring device and techniques, design of pneumatic gauges in process gauging methods.

UNIT 4

Geometrical and positional tolerances
Geometrical and physical limitations in measuring devices.

REFERENCES:

1. Metrology:-1 .C. Gupta (Dhanpat Rai Pub.)
2. Engg. Metrology :- R. K. Rajput (S. K. Kataria and sons)
3. Metrology :- R. K. Jain.
4. PSG design data book for Gauge

MTMA21D2- . DESIGN AND METALLURGY OF WELDED JOINTS

L T P Sessional : 50 Marks
4 0 0 Theory : 100 Marks
Total : 150 Marks
Duration of Exam : 3 Hrs

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UNIT 1.

Weld defects: common weld defects like weld cracks, LOP, LOF, porosity, blow holes etc., remedies and control, welding symbols.

Cost analysis of welded joints: costing factors of welding jobsfabrication cost, material cost, preparation cost, finishing cost, overhead cost etc., economy in preparation and welding a job, labour accomplishment factor, cost calculation of welded jobs.

UNIT2.

Prediction and control of distortion: calculation of longitudinal contraction, transverse contraction, angular contraction due to single weld pass, control of welded distortion, and calculation of shrinkage.

Residual stresses: introduction, types, effect of thermal stresses, control of residual welding stresses.

UNIT3.

Destructive and non destructive testing of welds: destructive tests, equipment required and test piece geometry for tensile test, bend test, impact test, hardness test, brittle and fatigue failure tests, non destructive tests for welds:-dye penetrate inspection, magnetic particle inspection etc.

Weldability tests: definition and concept of weldability, purpose and types of weldability tests such as hot cracking test, root cracking tests, hydrogen induced cracking test, cruciform test.

UNIT4.

.Weld ability of metals: welding techniques, preparation of joints and electrode types for gray cast iron welding, aluminium welding, austenitic steels , titanium and its alloys.

Welding metallurgy: thermal effect of welding on parent metal, structure of fusion welds, effect of cooling rate, weld metal solidification and heat affected zone.

Automation in welding: introduction and concept, classification of welding automation, economics of welding automation.

REFERENCE BOOKS:

1. Modern welding technology:- carry H. B. (PH).
2. Welding technology: - A. C. Devis.
3. Welding and welding Technology : Little (TMH)
4. Welding technology : R. S. Parmar.
5. AWS - welding handbook (IV- VI) Edition.
6. Elements of machine design : Pandya and shah.

MTMA21D3- FOUNDRY TECHNOLOGY

L T P
4 0 0
Total : 150 Marks

Sessional : 50 Marks
Theory : 100 Marks

Duration of Exam : 3 Hrs.

UNIT 1

1. Items (Domestic and Engg.) made by foundry technology. Advantage and limitations of foundry technology and other manufacturing process.
2. Castability and factors favoring castability. Ferrous and Non ferrous casting metals and alloys and items made of them.
3. Melting furnaces for cast iron , cast steels, aluminium alloys, brass and bronzes.
4. Solidification of castings.

UNIT 2

5. Mold design considerations: Conceptual, functional and production phase. Pattern and core design considerations, traffic rules applications. Examples, case studies.
6. Gating system elements: objectives,practicalrules,optimal time filling, types of pouring basin, types of gates, types of risers.

UNIT3

7. Special casting methods: Gravity die casting, cold chamber die casting, hot chamber die casting, investment casting, centrifugalcasting,shell mold casting.continuous casting.
8. Rough cleaning (Fettling) and surface cleaning of castings.
9. Casting inspection.

UNIT 4

10. Repair and salvage of castings.
11 .Heat treatment of castings.
12. Quality control of castings.
13. Pollution control in foundry.
14. Modernisation of foundry.

REFERENCE BOOKS:

1. Principal of metal casting by Richard W.Heine , Carl R Hoper. Philip C. RosenthaT, Tata Me Graw Hill.
2. Principal of foundary technology by P. L. Jain , Tata Me Graw Hill
3. Foundary practice by W.H. Salmon

MTMA21D4: DESIGN PLANNING AND CONTROL OF PRODUCTION SYSTEM

L-T-P

4 0 0

Sessional :50

Theory :100 marks

Total :150 marks

Duration of Exam :3hrs

UNIT 1

Introduction to production systems : Aim of production system, generalized model and types of production systems Features compiling service organizations, life cycle approach to production management.

UNIT 2

Product development and design : New product development and process selection, stages in new product development, ues of decision tree, Break even analysis, Make// buy decision, Problems for break even analysis non linearity in B.E. analysis, selection of location among alternatives- A case study, systematic layout planning, objectives , types, comparison and application of different types of layouts,.

UNIT 3

Assembling line balancing concept and problems for maximum line efficiency. Planning for production : Importance, objective and types of forecasting methods, Analysis and comparison standard error of estimate, Material Requirement planning, (MRP) objective, dependent demand, input to MRP, MRP model, Production schedule, MRP logic comparison.

UNIT 4

Sequencing & Scheduling : Criteria for sequencing, Priority sequencing and rules, n job 2 machine, n job 3 machine, n job m machine problems. Element of monitoring and follow up\

Reference Books ; 1. Production operations management : Buffa, Edwood 2. Elements of production , planning and control - Eilon Samuel A 3. Production control: A quantitative approach - Biegel. J 4.Industrial engineering and production management - MartandTelsang 5. Operations management-Theory and problems- Joseph Monks

MTMA22C1- MECHANICAL DESIGN-I

L T P CREDIT **SESSIONAL:50 Marks**
4 0 0 4 **THEORY :100 Marks**
TOTAL :150 Marks
DURATION OF EXAM.:3 Hrs.
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Unit 1

1. ConceptDesgin:Brainstormingmethodsandsketching

Unit 2

2 QualityFunctionDevelopment

3 MaterialCharacteristics:Mechanical,thermalandelectrical properties.

Unit 3

4 Design:Designforassembly. Designformanufacturing.

Unit 4

5 Productiontechnologies:Metalforming,casting,maching, surfacetreatment,welding,bonding,fastening,clinching.

REFERENCEBOOKS:

1. QualityFunctiondevelopment,L.Cohen.
2. ManfacturingEngg.:PrinciplesforOrganization,D.T.Koenig.
3. MaterialsScienceandEngineering:AnIntroduction,W.D. CallisterJr.
4. HandbookofAluminum:AlloyProductionandMaterials ManfacturingVol.2,G.E.Totten.
5. CADSoftwareCatia,Dassaultsystem.

MTMA22C2- DiagnosticMaintenance&Monitoring

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

Unit 1

Maintenance Management

Relevance of manintenance,maintenance: an over view,maintenanceservices,problems of the plant manager,automation and maintenance,maintence objectives and costs,quality and quality circle in maintence,Engineeringreliability,maintainability

Unit 2

Failure analysis

Defect generation,types of failures,FTA,FMEA,FMECA
Maintenance Types/sytems
Planned and unplanned maintenance,breakdown,corrective,opportunistic,routine,preventive,predictive,CBM,Design out maintence

Unit 3

Condition monitoring

NDT concepts,visual and temperarturemonitoring,leakagemonitoring,vibrationmonitoring,lubricant monitoring-methods,equipments,ferrography,spectroscopy,cracksmonitoring,thicknessmonitoieng,corrosionmonitoing,noisemonitoring,soundmonitoring,smell monitoring

Unit 4

Total productive maintenance

Development and scope of concept,,TPM,terotechnology,basic systems of TPM,procedure and steps of TPM,productivity circle

Books:

Maintenanceplanningandcontrol-Kelly,A.Buttersworth&Co.1984
MaintenanceandsparepartsManagement–KrishananG,PrenticeHall–1991

MTMA22C4- CIM LAB

L T P CREDIT SESSIONAL:50 Marks
4 0 3 2THEORY :100 Marks
TOTAL :150 Marks
DURATION OF EXAM.:3 Hrs.

LISTOFEXPERIMENTS:

1. TostudygeneralfeaturesofMachiningCenter.
2. TopreparetheCNCpartprogramformachiningaprismatic componentonCNCmachiningcentre.
3. TostudythegeneralfeaturesofaCNCTurningcenter.
4. TopreparetheCNCpartprogramformachiningofa CylindricalComponent.
5. StudyandApplicationsofRoboticsysteminAutomated storageand Retrievalsystem.
6. ApplicationandControlofroboticsysteminFlexible manufacturingSystem.
7. TostudythegeneralfeaturesofAutomatedGuidedVehicle.
8. TostudythegeneralconfigurationofCMManditsApplication inCIMenvironment.
9. MachineVisionandQualityControlinCIMenvironment.
10. StudyandApplicationsofConveyerSysteminCIMsystem.
11. Studyandapplicationof CIMsoftware

MTMA22C5- DiagnosticMaintenance&Monitoring Lab

L T P CREDIT SESSIONAL:50 Marks
0 0 3 2THEORY :100 Marks
TOTAL :150 Marks
DURATION OF EXAM.:3 Hrs.

List of Experiments.

1. To study the introductionto maintenancetechniques.preventiveandpredictiveMaintenance
2. To study and perform Non-DestructiveTesting techniques , liquid dye penetrant and leak testing.
3. To study and perform, Boroscope ,Flexiscope.
4. To study and perform Eddy current testing &Ultrasonictesting .
5. To study and performMagnetic particle detection and Particle counter.
6. To study wearAnalysisthroughthermographyandFerrography.
7. To study the applicationsofDiagnosticMaintenancetoIndustrialMachinesandplantssuchasSugar Industryor TextileMills or ThermalPowerplantsandRailways.
8. To study the Maintenanceplanningandcontrolof alargefactory,workplanningandworkcontrol.

List of Soft Core –II

MTMA22D1- QUALITY CONTROL TECHNIQUES
MTMA22D2- FINITE ELEMENT METHODS
MTMA22D3- ARTIFICIAL INTELLEGENCE IN MANUFACTURING

MTMA22D1- QUALITYCONTROLTECHNIQUES

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

UNIT I

Statistical concepts in Quality Control, variables and attributes,GraphicalRepresentation,Continuous and Discrete ProbabilityDistributions,controllimitTheorem.
IntroductiontoQualityControl,processControlandProduct Control,ChanceandAssignable causesofQualityvariation, AdvantagesofShewhartcontrolcharts,ProcessControlcharts forvariables,X,RandPcharts,fixationofcontrollimits,TypeI andTypeIIErrors,

UNIT II

Theoryofruns,InterpretationofOutofControl points,Probabilitylimits,Initiationofcontrolcharts,Trialcontrol limits,DeterminationofaimedatvalueofProcessSetting,Rational methodofsubgrouping,controlchartparameters,controllimits andspecificationlimits,Naturaltolerancelimits,Relationshipof aprocess inControl toupper andlower specificationlimits, processcapabilitystudies.

UNIT III

Specialcontrolchartsfor variables, groupcontrolchart, control charts with large sub groups,controlchartwithrejectlimits, use of control limits for moving averages

VariablesinspectionandAttributesinspection,Relativemerits anddemerits,ControlchartsforAttributes,pchartandnpchart, varyingcontrollimits,highdefectivesandlowdefectives,CUSUMor Cumulativesum controlchart,Averagerun length (ARL)Relativeefficiencyorsensitivityofcontrolchart.

UNIT IV

Probabilitytheory,binomial andPoissondistribution, Acceptance Inspection, 100% Inspection, No Inspection and samplingInspection,operatingcharacteristiccurve(O.C.curve). EffectofsamplesizeandAcceptancenumber,typeAandtype BO.C.curves,Single,DoubleandMultiplesamplingPlans,SS Plan.Acceptance/RejectionandAcceptance/RectificationPlans, ProducersRiskandConsumer'sRisk,IndifferenceQualitylevel, AverageOutgoingquality(AOQ)curve,AOQL,qualityprotection offeredbya samplingPlan,

REFERENCEBOOKS

1. StatisticalQualitycontrolbyE.L.Grant
2. QualitycontrolandIndustrialStatistics,byA.J.Duncan
3. QualitycontrolbyDaleH.Bestefield
4. TotalQualityControlbyA.Y.Feigenboum
5. ElementaryS.O.L. by I.W.Burr, M. Dekkar.

MTMA22D2- FINITEELEMENTMETHODS

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

UNIT I

ReviewofbasicFEMconcepts

FEMDiscretizationandthe DirectStiffnessMethod:Basic conceptsofstructuralmodeling,Reviewofthestiffnessmethod ofstructuralanalysis,Modelingstiffness,loadsanddisplacement boundaryconditions

FormulationofFiniteElements: Mathematicalinterpretationof finiteelements,variationalformulation,Developmentofcontinuum elements,shape functions,consistentloads,Isoparametricelementsforplanestress,Numericalintegration,Conv ergence requirements.

Computer ImplementationoftheFiniteElement Method: Preprocessing:model definition,Elementlevelcalculations, Equationassembly,Equationsolver,Postprocessing:strainand stressrecovery.

UNIT II

Advancedtopicsinlinearproblems: Staticcondensation andsub-structuring, Patchtestandincompatibleelement,p- formulation

AdvancedBeam,PlateandShellelements:

a. Timoshenkobeamtheory(shearlocking)

b. Plateandshelltheory

i. ThinplateandMindlinplate(shearandmembrane locking)
ii. Mixedformulationforplateandshell
iii. Degeneratedshellformulation

DynamicanalysisusingFEM

a. Consistentmassandlumpedmass,masslumping technique
b. Timeintegrationmethods:explicit,implicit,explicit-implicit methods.
c. Stability,convergenceandconsistency
d. Hyperbolicsystems:structuraldynamicsandwave propagation
e. Parabolicsystem:transientheattransfer
f. Modalsolutionfornaturalfrequenciesandmodeshapes g. ModalSuperposition methodforstructuraldynamics

Nonlinearanalysis

a. Nonlinearsolutionprocedures
b. Newton-Raphson,modifiedNewton-Raphson,andsecant methods
c. Linesearchalgorithm
d. Automatictimestepcontrol

UNIT III

Materialnonlinearity

a. Rateindependentelastoplasticitywithreturn-mapping algorithm

b. IsotropicandkinematichardeningwithBaushingereffect c. Consistenttangent operator

d. Objectiverateandfiniterotationelastoplasticity
e. Multiplicativedecompositionandfinitedeformation elastoplasticity

Geometricnonlinearity
a. Generalizedstrainandstress
b. TotalandUpdatedLagrangianformulation c. Kirchhoffstressand Cauchystress

Boundarynonlinearity
a. Frictionlesscontactproblems
b. Penalty,Lagrangemultiplier,augmentedLagrange multiplier,andperturbedLagrangemultipliermethods
c. Frictionalcontactproblemsincludingfrictionalreturn mappingalgorithm
d. Rigid-flexiblecontactandflexible-flexiblecontact
e. Multiplicativedecompositionandfinitedeformation elastoplasticity

UNIT IV

Geometricnonlinearity
a. Generalizedstrainandstress
b. TotalandUpdatedLagrangianformulation c. KirchhoffstressandCauchystress

Boundarynonlinearity
a. Frictionlesscontactproblems
b. Penalty,Lagrangemultiplier,augmentedLagrange multiplier,andperturbedLagrangemultipliermethods
c. Frictional contactproblemsincludingfrictionalreturn- mappingalgorithm
d. Rigid-flexiblecontactandflexible-flexiblecontact

AssignmentsandTutorialsareessentialpartofthiscourse. Variousprogrammingandformulationproblemswillbe assignedthroughthecourseofstudy.Inaddition,students arerequiredtocompleteoneprojectisrelatedtocomputer implementationofFEMconcepts,applicationtoplasticity, solvingnonlinearstructuralproblemsusingcommercial programs

MTMA22D3- ARTIFICIALINTELLIGENCEINMANUFACTURING

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

UNIT I

Definition,basicconceptsofartificialIntelligence,scope,roleand potentialofartificialintelligenceinmanufacturing,Expertsystems, PopularAIapplication.

UNIT II

OverviewofExpert systems,architecture,comparisonwith procedural programming,developingExpertsystemfortypical manufacturingdomains,implementationandmaintenance,state- of-art Expert systemapplication, casestudy.

UNIT III

Altheoryproblems,problemspacesandsearch,Heuristicsearch technique,Knowledgeacquisitionandknowledgerepresentation, predicatelogic,procedurals,Declarativeknowledge,forwardV/ s backwardreasoningAI architecture,overviewofadvanced features,planning,learning,naturallanguageprocessing,neural nets,fuzzylogic,objectorientedprograms.

UNIT IV

Case studies,examples ofAI, theoreticalconceptstomanufacturing problems,CAD, CAPP,scheduling GT,CIM system.
Domainswelding,casting,forming,metalcutting,maintenance