Millia Institute of Technology
Rambagh, Purnea

Affiliated to BIhar Engineering University, Patna

NAAC Accredited & ISO 9001:2015

SYLLABUS

Department of Mechanical Engineering

6th SEMESTER

Semester VI (Third year]
Branch/Course Mechanical Engineering

Course Code	Paper Title	L	T	P	Credits	branch
	Design of Machine Elements	3	1	2	5	102
	Dynamics of Machinery	3	0	3	4.5	102
	Graduate Employability Skills and Competitive Courses (GATE, IES, etc.)	3	0	0	0	102
	Manufacturing Technology	3	0	3	4.5	102
	Open Elective- I	3	0	0	3	102
	Program Elective- I	3	0	0	3	102
	Program Elective- II	3	0	0	3	102

MECHANICAL 6TH SEMESTER

Semester VI (Third year]Branch/CourseMechanicalEngineering

100602	**DynamicsofMachinery**		

Objectives:

1. To equip the student with fundamental knowledge of dynamics of machines so that studentcan appreciate problems of dynamic force balance, transmissibility of forces, isolation ofsystems,vibrations.
2. Developknowledgeofanalyticalandgraphicalmethodsforcalculatingbalancingofreciprocatingmasses.
3. Developunderstandingofvibrationsanditssignificanceonengineeringdesign.
4. Developunderstandingofdynamicbalancing,flywheelanalysis,gyroscopicforcesandmoments.

Contents:

Module:1

Force analysisofmechanism:Dynamicsofplanemotionofarigidbody,dynamicallyequivalenttwomasssystem,correctiontorque, forcedinmechanism andmachines. **(Lectures 3)**

Module: 2

Turningmomentdiagram:Fluctuationsofcrankshaftspeedandenergyinadirectactingenginemechanism,flywheels. **(Lectures 5)**

Module:3

Cams: Classification of cams and followers, types of follower and retardation, cam profile andgeneration of concentric and offset radial cam profiles by graphical method. Cams with specifiedcontourstangentcamwithrollerfollower,circulararccamwithflatfollower. **(Lectures 8)**

Module:4

Analysis of gyroscopic motion : Principle of gyroscope, gyroscopic couple and gyroscopic reactioncouple, Gyroscopic effects on the movement of ships, aeroplanes, two wheeled and four wheeledvehicles,gyrostabilizers. **(Lectures6)**

Module:5

Effects of inertia of reciprocating masses onengine frame: Unbalanced primary and secondaryforcesandcouples,balancingofprimaryandsecondaryforces,partialbalancingoflocomotives,

balancingofmulticylinderinlineandradialengines,directandreversecranksmethodsforbalancingofradia lengines. **(Lecture8)**

Module:6

Mechanical vibrations : Basic concepts degree of freedom, types of damping and viscous damping;natural free, damped free and damped forced vibrations of a single degree of freedom spring masssystem, reciprocating and rotating unbalance, vibration isolation and transmissibility, whirling ofshaft, elementary treatment of two degree of freedom systems torsional vibrations of single rotorand two rotor systems, transverse vibration of simply supported beam energy method, Rayleigh'sandDankerleymethod. **(Lecture12)**

Text/ReferencesBooks:

1. TheoryofMachines /S.SRatan/ Mc.Graw HillPubl.
2. Mechanismand machinetheorybyAshok G. Ambedkar, PHIPublications.
3. MechanismandMachine Theory/JSRao andRVDukkipati /NewAge.
4. Theoryof Machines / Shiegly/ MGH
5. Theoryof Machines /Thomas Bevan/ CBS Publishers
6. Theoryofmachines / Khurmi / S.Chand.

Laboratory:

Minimumof10Experimentneedtobeperformed

1. TostudyvarioustypesofLinks,Pairs,ChainandMechanism
2. Tostudyinversion of Four BarMechanism
3. To studyvelocitydiagram for Slider Crank Mechanism.
4. To studyvarious kinds of belts drives.
5. Tostudyandfind coefficientoffriction betweenbeltandpulley.
6. Tostudyvarious typesofCamand Follower arrangement.
7. ToplotfollowerdisplacementVscamrotationgraphforvariouscamfollowerarrangement.

8. TostudyDifferent typesofGears.
9. TostudyDifferenttypesofGearTrains.
11. ToPerformExperimentonWatt,Porter,ProellandHartnellGovernorsandpreparePerformanceCharacteristicCurves also analyzeStability&Sensitivity
12. Tostudygyroscopiceffectsthroughmodels.
13. TodeterminegyroscopiccoupleonMotorizedGyroscope.
14. Toperformtheexperimentof Balancingofrotatingpartsandfindtheunbalancedcoupleandforces.
15. To studyDynamicallyEquivalent System.
16. Determinethemomentofinertialofconnectingrodbycompoundpendulummethodandtriflersuspension pendulum.
17. Tostudythe varioustypes ofdynamometers.
18. Tofindoutcriticalspeedexperimentallyandtocomparethe WhirlingSpeedofashaftwiththeoreticalvalues

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102603	ManufacturingTechnology		

Objectives:

(i) Toprovideknowledgeonmachinesandrelatedtoolsformanufacturingvariouscomponents.
(ii) Tounderstandtherelationshipbetweenprocessandsysteminmanufacturingdomain.
(iii) Toidentifythetechniquesforthequalityassuranceoftheproductsandtheoptimalityof theprocessinterms ofresources andtimemanagement.

CourseContents:

Module:1 **7 hours**

Tooling for conventional and non-conventional machining processes: Mould and die design.

Module 2 7 hours

Presstools, Cutting tools; Holding tools: Jigs and fixtures, principles, applications and design; press tools –configuration,designofdie andpunch;principlesofforgingdiedesign.

Module:3 **7 hours**

Metrology: Dimensions, forms and surface measurements, Limits, fits and tolerances; linear andangularmeasurements;comparators;gaugedesign;interferometry;

Module 4 **7 hours**

Metrologyintoolwearandpartqualityincludingsurfaceintegrity,alignmentandtestingmethods;toleranceanalysisinmanufacturingandassembly.Processmetrologyforemergingmachiningprocessessuchasmicroscalemachining,Inspectionandworkpiecequality.

Module:5 **5 hours**

Assembly practices: Manufacturing and assembly, process planning, selective assembly, Materialhandlinganddevices.

Module:6 **9 hours**

Unconventional Machining Processes: Abrasive Jet Machining, Water Jet Machining, Abrasive WaterJetMachining,UltrasonicMachining,principlesandprocessparameters.ElectricalDischargeMachining,principleandprocessesparameters,MRR,surfacefinish,toolwear,Dielectric,powerand control circuits, wire EDM; Electro-chemical machining (ECM), etchant &maskant, processparameters, MRR andsurface finish. LaserBeamMachining (LBM), PlasmaArc Machining (PAM)andElectron BeamMachining

TextBooks:

1. KalpakjianandSchmid,Manufacturingprocessesforengineeringmaterials(5thEdition)-PearsonIndia,2014.
2. TahaH.A.,OperationsResearch,6thEdition,PrenticeHallofIndia,2003.

3. ShenoyG.V.andShrivastavaU.K.,OperationsResearchforManagement,WileyEastern,1994.

Laboratory:

1. Measurementofangle usingSineCenter/Sinebar /bevelprotractor
2. MeasurementofalignmentusingAutocollimator/Roller set
3. Measurementof cuttingtool forcesusing
    a. LathetoolDynamometer
    b. DrilltoolDynamometer.
4. Measurementof ScrewThreads ParametersusingTwowireorThree-wiremethod.
5. MeasurementsofSurface roughness,UsingTallySurf/Mechanical Comparator
6. Measurementof geartoothprofileusinggeartoothVernier/Geartooth micrometer
7. CalibrationofMicrometerusingslip gauges
8. MeasurementusingOpticalFlats

102601	DesignofMachineElements		

Objectives:

Thiscourseseekstoprovideanintroductiontothedesignofmachineelementscommonlyencountered in mechanical engineering practice, through 1. A strong background in mechanics ofmaterials based failure criteria underpinning the safety-critical design of machine components 2. Anunderstanding of the origins, nature and applicability of empirical design principles, based on safetyconsiderations 3. Anoverview ofcodes, standards anddesignguidelines for differentelements 4.Anappreciationofparameteroptimizationanddesigniteration5.Anappreciationoftherelationshipsbetweencomponentleveldesignandoverallmachinesystemdesignandperformance

CourseContents:

Module:1 **7 hours**

Introduction to design: Steps in design process, design factors, practical considerations in design,selection of materials, strength of mechanical elements, impact load, shock load, fatigue loading,effects of surface, size, temperature and stress concentration.

Module 2 7 hours

consideration of creep and thermalstressin design;**Design of shafts**: stresses in shafts, design of static loads, combined stresses, reversed bending andsteady loads.

Module 3 6 hours

design of shafts based on deflection and strength, critical speed of shafts. Analysis anddesignofslidingandrollingcontactbearings,

Module:4 8 hours

Riveted joint: Stresses in riveted joint, design of riveted joints with central and eccentric loads,boilerandtankjoints,structuraljoints

BoltJoints: Stressesinboltjoint,designofboltjointswithcentralandeccentricloads.

Welded joints: types of welded joints, stresses, design of welded joints subjected to axial, torsionalandbending loads,weldssubjectedtofluctuatingloads

Module:5 **7 hours**

Design of Clutches: Friction clutches, uniform wear and uniform pressure assumptions, centrifugalclutches.

Brakes: Designofinternalexpansionelements,assumptions,designofexternalcontractionelements,bandtypebrakes.

Module:6 **7 hours**

Designoftransmissionelements:spur,helical,bevelandwormgears;

Springs: stresses in helical springs, deflection of helical compression and tension springs, springssubjected to fatigue loading, concentric and helical torsion spring, critical frequency of

springs, leafsprings,anddesignofautomotiveleafsprings.

DatabooksallowedforExamination:

1. Mahadevan&BalaveeraReddy:Design DataHand Book
2. Dr.Linghaigh&Prof.NarayanaIyengar,Vol.1&2:DesignDataHandBook
3. P.S.G.Tech :DesignDataHandBook

TextBooks:

1. Shigley, J.E. and Mischke, C.R., Mechanical Engineering Design, Fifth Edition, McGraw-HillInternational;1989.
2. Deutschman,D.,Michels,W.J.andWilson,C.E.,MachineDesignTheoryandPractice,Mac millan,1992.
3. Juvinal,R.C.,FundamentalsofMachineComponentDesign,JohnWiley,1994.
4. Spottes,M.F.,DesignofMachineelements,Prentice-HallIndia,1994.
5. R.L.Norton,MechanicalDesign–AnIntegratedApproach,PrenticeHall,1998

Laboratory:

1. Tostudythe design procedure ofKnuckle &Cotterjoint.
2. Designofshaftssubjectedtotorsion, bendingmomentandcombinedbendingand torsion.
3. Designofflatandsquarekey
4. Designanddrawingofrivetedjoints
5. Designanddrawingofscrewjack
6. JournalBearingTestRig