

REGULATION 2018

COURSE STRUCTURE

SYLLABUS



2 Years M.Tech Degree Programme

MACHINE DESIGN

DEPARTMENT OF MECHANICAL ENGINEERING

GIET MAIN CAMPUS AUTONOMOUS GUNUPUR – 765022

(Affiliated to Biju Patnaik University of Technology, Rourkela)

Accredited by NAAC with 'A' Grade with a CGPA of 3.28/4.00

Accredited by NBA

Regulation 2018



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
 Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
 Accredited by NAAC with a CGPA of 3.28/4 at A Grade
 Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

I SEMESTER

Sl. No.	Course Category	Course Code	Course Title	L	T	P	C
THEORY							
1	PC	MMDPC1010	Applied Elasticity and Plasticity	3	1		4
2	PC	MMDPC1020	Machine Vibration	3	1		4
3	PE-1	MMDPE1031	Fatigue, Creep & Fracture	3	0	0	3
		MMDPE1032	Computer Aided Design				
		MMDPE1033	Optimum Design of Mechanical Systems				
		MMDPE1034	Analysis and Design Of Pressure Vessels And Piping				
4	PE-2	MMDPE1041	Numerical Analysis	3	0	0	3
		MMDPE1042	Instrumentation and Automatic Control Systems				
		MMDPE1043	Advanced Mechanisms of Machines				
		MMDPE1044	Advanced Mechanics of Solids				
PRACTICAL							
5	ES	MMDES1150	Engineering Software Lab	0	0	8	4
TOTAL				12	2	8	18



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
 Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
 Accredited by NAAC with a CGPA of 3.28/4 at A Grade
 Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

II SEMESTER

Sl. No.	Course Category	Course Code	Course Title	L	T	P	C
THEORY							
1	PC	MMDPC2010	Mechanics of Composite Materials	3	1	0	4
2	PC	MMDPC2020	Experimental Stress Analysis	3	1	0	4
3	PE-3	MMDPE2031	Finite Element Method	3	0	0	3
		MMDPE2032	Computer Graphics and Visualization				
		MMDPE2033	Basic Mechanical Handling Systems				
		MMDPE2034	Analysis and Synthesis of Mechanism				
5	PE-4	MMDPE2041	Bearing and Lubrication	3	0	0	3
		MMDPE2042	Robotics				
		MMDPE2043	Machine Tool Design				
		MMDPE2044	Advanced Gear Engineering				
PRACTICAL							
7	ES	MMDES2150	Advanced Design Engineering Lab	0	0	8	4
TOTAL				12	2	8	18



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
Accredited by NAAC with a CGPA of 3.28/4 at A Grade
Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

III SEMESTER

Sl. No.	Course Category	Course Code	Course Title	L	T	P	C
THEORY							
1	OE	MMDOE3011	Research Methodology	3	0	0	3
		MMDOE3012	Human Resource Management				
		MMDOE3013	Project Management And Costing				
	PE	MMDPE3021	Machine Fault Diagnosis And Signal Processing	3	0	0	3
		MMDPE3022	Mechatronics				
		MMDPE3023	Mechanical Drives				
2		MMDPE3024	Dyanamics Of Rotors				
3	ES	MMDES3130	Dissertation Phase-I	0	0	20	10
TOTAL				6	0	20	16

IV SEMESTER

Sl. No.	Course Category	Course Code	Course Title	L	T	P	C
1	ES	MMDES4110	Dissertation Phase-II	0	0	32	16
TOTAL				0	0	32	16



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
Accredited by NAAC with a CGPA of 3.28/4 at A Grade
Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

SCHEME OF INSTRUCTION SUMMARY

SL. NO.	COURSE WORK - SUBJECTS AREA	CREDITS / SEMESTER				TOTAL CREDITS	%
		I	II	III	IV		
1	Professional Core (PC)	8	8			16	
2	Professional Electives (PE)	6	6	3		15	
3	Open Electives (OE)			3		3	
4	Engineering Science(ES)	4	4			8	
4	Thesis Work , Seminar and VIVA-VOICE			10	16	26	
	TOTAL	18	18	16	16	68	



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
 Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
 Accredited by NAAC with a CGPA of 3.28/4 at A Grade
 Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

I SEMESTER

Sl. No.	Course Category	Course Code	Course Title	L	T	P	C
THEORY							
1	PC	MMDPC1010	Applied Elasticity and Plasticity	3	1	0	4
2	PC	MMDPC1020	Machine Vibration	3	1	0	4
4	PE-1	MMDPE1031	Fatigue, Creep & Fracture	3	0	0	3
		MMDPE1032	Computer Aided Design				
		MMDPE1033	Optimum Design of Mechanical Systems				
		MMDPE1034	Analysis and Design Of Pressure Vessels And Piping				
5	PE-2	MMDPE1041	Numerical Analysis	3	0	0	3
		MMDPE1042	Instrumentation and Automatic Control Systems				
		MMDPE1043	Advanced Mechanisms of Machines				
		MMDPE1044	Advanced Mechanics of Solids				
PRACTICAL							
6	ES	MMDES1150	Engineering Software Lab	0	0	8	4
TOTAL				12	2	8	18



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
Accredited by NAAC with a CGPA of 3.28/4 at A Grade
Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

Subject Code	Subject Name	L	T	P	C
MMDPC1010	APPLIED ELASTICITY AND PLASTICITY	3	1	0	4
SYLLABUS					
UNIT:1		[14 Hours]			
Stress-strain relations for linearly elastic solids, Generalized Hooke's law. Analysis of three-dimensional stresses and strains. Tensor character of stress. Strain-displacement relations, equilibrium equations, compatibility conditions and Airy's stress function, Plane stress and plane strain, simple problems in cartesian and polar co-ordinates,					
UNIT:2		[13 Hours]			
Solution of axisymmetric problems, Bending of beams and plates, Kirkhof and Mindlin concept. Torsion problem with St.Venant's approach-Prandtl's approach - Torsion of thin walled open and closed sections & thermal stress.					
UNIT:3		[13 Hours]			
Theoretical concepts of plasticity, Yield criteria - Tresca and Von Mises criterion of yielding, Plastic stress strain relationship, Elastic plastic problems in bending and torsion.					
Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert.					
Text Book:					
1. Timoshenko, S. and Goodier J.N. Theory of Elasticity, McGraw Hill Book Co., New York, 1988.					
2. J. Chakrabarty, Theory of Plasticity, McGraw-Hill Book Company, New York 1990					



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
Accredited by NAAC with a CGPA of 3.28/4 at A Grade
Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

Subject Code	Subject Name	L	T	P	C
MMDPC1020	MACHINE VIBRATION	3	1	0	4
SYLLABUS					
UNIT:1 [12 Hours]					
Review of free and forced vibrations with and without damping. Hamilton's Principle. Isolation: Theory of oscillation of single degree freedom system with application to Vibration isolation and vibration measurement. Vibration isolation and transmissibility; Un-damped vibration absorbers.					
UNIT:2 [15 Hours]					
Multi degree of freedom system: Generalized coordinates and coordinate coupling; Orthogonality of modes, Free and forced vibration of multi-degree of freedom systems with and without viscous damping; Lagrange's equation; Holzer's method. Solution of Eigen value problem, transfer matrix and modal analysis. Multi-degree freedom system with application to measurement. Multiple degree of freedom systems with applications to dynamic vibration absorbers. Application of matrix to vibrational problems, General theory of small oscillation of conservative systems, principal frequencies and modes. Introduction of Rayleigh and Rayleigh-ritz Methods.					
UNIT:3 [13Hours]					
Continuous System: Transverse vibration of a string, longitudinal vibration of a bar, torsional vibration of a shaft, transverse vibration of a beam. Vibration of membranes and plates, Laplace Transforms and operational Methods.					
Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert.					
Text Book:					
1. Mechanical Vibration: Theory and Applications - F.S. Tse, I.E. Morse and R.T. Hinkle. CBS Publishers, 2002.					



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
 Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
 Accredited by NAAC with a CGPA of 3.28/4 at A Grade
 Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

2. Theory of Vibration with Application - W.T. Thomson, PHI, 1979.

Subject Code	Subject Name	L	T	P	C
MMDPE1031	FATIGUE, CREEP & FRACTURE	3	0	0	3
SYLLABUS					
UNIT:1		(12 Hours)			
<p>Fatigue: Types of fatigue loading and failure, Fatigue test, endurance limit; Fatigue under combine stresses; Influence of stress concentration on fatigue strength, Notch sensitivity, Factors influencing fatigue behaviour.</p>					
UNIT:2		(12 Hours)			
<p>Creep: Creep-stress-time temperature relations, Mechanics of creep in tension, bending, torsion, creep buckling. Members subjected to creep and combined stresses.</p>					
UNIT:3		(12 Hours)			
<p>Fracture:</p> <p>Basic modes of fracture, Griffith of brittle fracture, Irwin’s theory of fracture inelastic-plastic materials. Theories of linear elastic fracture mechanics, stress intensity factors, fracture toughness testing.</p>					
Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert.					
Text Books					
1. Strength and Resistance of Metals - J. M. Lessels, John Wiley and Sons, Inc., 1954.					
2. Mechanical Behaviour of Engineering Materials - Joseph Marin, PHI, 1966.					
3. Fatigue Testing and Analysis - Y. Lee, J.Pam, R.B. Hathaway & M.E. Barkey Elsevier Press, 2005.					
4. Engineering Fracture Mechanics - S. A. Meguid, Elsevier Press, 1989.					



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
Accredited by NAAC with a CGPA of 3.28/4 at A Grade
Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

Subject Code	Subject Name	L	T	P	C
MMDPE1032	COMPUTER AIDED DESIGN	3	0	0	3
SYLLABUS					
UNIT:1 (12 Hours) Introduction: The design process, elements of CAD; Principles of Software Design: Characteristics of good software, data structures, algorithm design, flow chart, coding, top down programming, modular programming, structural coding, testing of the software.					
UNIT:2 (12 Hours) Computer Graphics: Graphics display, transformations, visualizations, computer animation. 3D Modelling and Viewing: Coordinate systems, sketching and sketch planes; Modelling aids and tools; Layers, grids, clipping, arrays, editing. Curves Modelling: Analytical and synthetic curves, curve manipulations. Surface Modelling: Surface representation and surface analysis, analytical and synthetic surfaces, surface manipulations, NURBS.					
UNIT:3 (12 Hours) SOLID MODELING: Geometry and topology, solid entities, solid representation, fundamental of solid modelling, half spaces, boundary representation, constructive solid geometry, sweeps, solid manipulations. Features: Feature entities, feature representation, three dimensional sketching, parametric, relations, constraints, feature manipulation. Mass properties: Geometric and mass properties evaluation, assembly modelling, product data exchange.					
Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert.					
Text Books 1. Zeid I., "Mastering CAD/CAM", Tata McGraw Hill. 2007 2. OnwubikoC., "Foundation of Computer Aided Design", West Publishing Company. 1989					



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
 Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
 Accredited by NAAC with a CGPA of 3.28/4 at A Grade
 Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

Subject Code	Subject Name	L	T	P	C
MMDPE1033	OPTIMUM DESIGN OF MECHANICAL SYSTEMS	3	0	0	3
SYLLABUS					
UNIT:1		(12 Hours)			
Introduction: Classification of optimization problems, mathematical models in engineering optimization. Concepts in linear optimization: General simplex method, revised simplex method, duality, decomposition principle, integer programming, branch and bound technique and the Gomory algorithm, post optimality analysis.					
UNIT:2		(12 Hours)			
Nonlinear programming without constraints: Local and global maxima, minima, Hessian matrix, Fibonacci method, Golden section method, random search method, steepest descent method and conjugate gradient method. Nonlinear programming with constraints: Lagrange multipliers, Kuhn - Tucker conditions, quadratic programming.					
UNIT:3		(12 Hours)			
Wolfe's and Beale's method, sequential linear programming approach, penalty methods. Interior and exterior penalty function method. Advanced optimization techniques: Concepts of multi - objective optimization, genetic algorithms and simulated annealing.					
Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert.					
Text Books 1.S.S.Rao, Optimization- Theory and Applications, ,Wiley Eastern, New Delhi, 1978 2.J.C.Pant, Introduction to Optimization, Jain Brothers, New Delhi, 1983 3. Kanthi Swaroop, et.at., Operations Research, S. Chand & Co., New Delhi, 4.Kalyanmoy Deb, Optimization for Engineering Design Algorithms and Examples, Prentice Hall of India, New Delhi, 1995 5. Kalyanmoy Deb, Multiojective Optimization –An evolutionary Algorithmic Approcach, John Wiley & Sons, New York.					



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
 Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
 Accredited by NAAC with a CGPA of 3.28/4 at A Grade
 Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

Subject Code	Subject Name	L	T	P	C
MMDPE1034	ANALYSIS AND DESIGN OF PRESSURE VESSELS AND PIPING	3	0	0	3
SYLLABUS					
<p>UNIT:1 (12 Hours) Introduction: Methods for determining stresses –Terminology and Ligament Efficiency –Applications. Stresses in Pressure Vessels: Introduction –Stresses in a circular ring, cylinder –Membrane stress Analysis of Vessel Shell components –Cylindrical shells, torspherical Heads, conical heads –Thermal Stresses –Discontinuity stresses in pressure vessels.</p>					
<p>UNIT:2 (12 Hours) Design of Vessels: Localized stresses and their significance – stress concentration – at a variable Thickness transition section in a cylindrical vessel, about a circular hole, elliptical openings. Theory of Reinforcement –pressure vessel Design. Supports for Vessels: introduction, bracket or lug supports, leg supports, skirt supports, saddle supports.</p>					
<p>UNIT:3 (12 Hours) Buckling and Fracture Analysis in Vessels:Buckling phenomenon – Elastic Buckling of circular ring and cylinders under external pressure – collapse of thick walled cylinders or tubes under external pressure. Buckling: Effect of supports on Elastic Buckling of Cylinders – Buckling under combined External pressure and axial loading. Piping: Introduction – Flow diagram – piping layout and piping stress Analysis.</p>					
Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert.					
Text Books					
1. John F.Harvey, Theory and Design of Pressure Vessels,CBS Publishers and Distributors, 1987.					
2.M.V. Joshi, Process Equipment Design,Macmillan India Ltd.					



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
 Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
 Accredited by NAAC with a CGPA of 3.28/4 at A Grade
 Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

Subject Code	Subject Name	L	T	P	C
MMDPE1041	NUMERICAL ANALYSIS	3	0	0	3
SYLLABUS					
<p>UNIT:1 (12 Hours)</p> <p>Transcendental and Polynomial equations: Initial approximations, First Degree Equation, Iteration Methods Based on Second Degree equation, Multipoint iteration method, Rate of Convergence, Efficiency of a method. System of Linear Algebraic Equations: Effects of Round-off Error, Operations Counts, Standard Methods of Solutions, Convergence analysis Eigen values and Eigenvectors Interpolation: Lagrange Polynomial Interpolation, Cubic Spline Interpolation.</p>					
<p>UNIT:2 (12 Hours)</p> <p>Numerical Differentiation - Finite Differences: Construction of Difference Formulae. Accuracy of Finite Differences, Pade Approximations, Non-Uniform Grids. Numerical Integration: Trapezoidal and Simpson's Rules, Error Analysis, Integration and Extrapolation, Quadrature. Numerical Solution Of Ordinary Differential Equations: Initial Value Problems, Numerical Stability, Stability Analysis, Implicit, Runge-Kutta Methods, Multi-Step Methods, System Of First-Order Ordinary Differential Equations, Boundary Value Problems.</p>					
<p>UNIT:3 (12 Hours)</p> <p>Numerical Solution of Partial Differential Equations: Semi-Discretization, von Neumann Stability Analysis, Modified Wave number Analysis, Implicit Time Advancement, Accuracy, Implicit Methods in Higher Dimensions, Approximate Factorization, Stability of the Factored Scheme, Alternating Direction Implicit Methods, Mixed and Fractional Step Methods, Elliptic Partial Differential Equations Discrete Transform Methods: Discrete Fourier series, Applications, Finite Differenced Elliptic Equations, Fourier Spectral Numerical Differentiation, Discrete Transform and Applications, Numerical Differentiation.</p>					
Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert.					
Text Books					
1. Numerical Methods for scientific & Engg Computation- M. K. Jain, S. R. K. Iyengar & Jain.					
2. Numerical Methods for Engineers – S. C. Chapra and R. P. Canale. Mc GrawHill.					



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
Accredited by NAAC with a CGPA of 3.28/4 at A Grade
Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

Subject Code	Subject name	L	T	P	C
MMDPE1042	INSTRUMENTATION AND AUTOMATIC CONTROL SYSTEMS	3	0	0	3
SYLLABUS					
UNIT:1 (12 Hours) Closed loop & open loop systems; Linear & non-linear systems; Proportional, Derivative & integral controller; Laplace transform method; Transfer function & Block diagrams; Deriving transfer functions of physical systems; Block diagram reduction; Signal flow graphs; Construction of signal flow graphs from block diagram; Mason's gain formula. First order systems; Second order systems; Higher order systems;					
UNIT:2 (12 Hours) Steady-state error & error constants; Routh stability criterion; Bode plot; Gain margin & Phase margin. Root locus method; Nyquist criterion; Closed loop frequency response; M- circle & N - circle; Lag & lead compensation.					
UNIT:3 (12 Hours) State space analysis - State variables; State - space representation; State equations; Relationship between state equations & transfer functions; Characteristics equation; Eigen values & Eigen vectors; State diagram; Solution of state equation; State transition matrix & its properties; Transfer matrix.					
Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert.					
Text Books 1. Mechanical Measurements - T.G. Beckwith, N.L. Buck, R.B. Marangoni. Narosa Publishing House 3 rd Edition, 1982 2. Measurements System : Application and Design - Ernest O. Doebelin, Mc-Graw Hill Books Co., 1990, 4 th Edition. 3. Modern Control Engineering - K. Ogata, PHI, 3 rd Edition, 2000.					



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
 Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
 Accredited by NAAC with a CGPA of 3.28/4 at A Grade
 Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

Subject Code	Subject Name	L	T	P	C
MMDPE1043	ADVANCED MECHANISMS OF MACHINES	3	0	0	3
SYLLABUS					
<p>UNIT:1 (14 Hours) Review of determination of velocity & acceleration of points & links in mechanisms – Analytical & graphical methods; Synthesis of Mechanisms - Function generation; Overlay’s method; Cognate linkages; Two position & three position synthesis of 4 - bar linkages & slider crank mechanisms; Coupler curve synthesis; Intermittent rotary motion -Geneva mechanism. Static & Dynamic Force Analysis – Forces, Couples, Conditions of equilibrium – Free body diagram; Analysis of 4 - bar linkages & slider crank mechanisms; Spur, Helical & Bevel gear force analysis; Static force analysis with friction.</p>					
<p>UNIT:2 (12 Hours) Dynamic force analysis – Centroid & Centre of mass; Moment of inertia; D’ Alembert’s principle; Rotation about a fixed centre; Dynamic analysis of 4 - bar mechanism. Balancing – Primary balancing, Secondary balancing, Balancing of 2 - cylinder & multi - cylinder engines, V -engines.</p>					
<p>UNIT:3 (14 Hours) Gyroscope –Motion of a rigid body in 3 - dimensions; Rigid body in spheric motion; Euler’s equation; Euler’s modified equation; Simple precession of a symmetrical rotor. Analysis of Cams –Basic curves; Cam size determination; Cam profile determination - Analytical & graphical methods; Advanced cam curves; Analytical cam design. Cam Dynamics –Response of undamped cam mechanisms; Follower response - Phase plane method; Numerical method; Jump & Cross-over shock.</p>					
Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert.					
<p>Text Books</p> <ol style="list-style-type: none"> 1. Theory of Machines and Mechanisms – J. E. Shigley and Jr. J. J. Uicker. Mc GrawHill Inc.1998. 2. Theory of Mechanisms and Machines – Amitava Ghosh and Mallik. EWP, New Delhi. 					



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
Accredited by NAAC with a CGPA of 3.28/4 at A Grade
Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

Subject Code	Subject Name	L	T	P	C
MMDPE1044	ADVANCED MECHANICS OF SOLIDS	3	1		4
SYLLABUS					
UNIT:1		(14 Hours)			
Shear center and unsymmetrical bending. Beam columns; Beams on elastic foundations; curved beams, rotating discs and thick cylinders. Virtual work; Minimum potential energy; Hamilton's Principle. Plate theory: Formulation by Hamilton's principle: Bending and buckling of homogenous and Sandwich Plates.					
UNIT:2		(14 Hours)			
Shell theory: Introduction to theory of surface; Formulation by Hamilton's Principle; membrane, bending and buckling analysis of shells of revolution. Stress-strain relations for linearly elastic solids, Generalized Hooke's law. Analysis of three-dimensional stresses and strains. Tensor character of stress. Strain-displacement relations, equilibrium equations, compatibility conditions and Airy's stress function.					
UNIT:3		(14 Hours)			
Plane stress and plane strain, simple problems in Cartesian and polar co-ordinates. Solution of axisymmetric problems, Bending of beams and plates, Kirchhoff and Mindlin concept. Torsion problem with St. Venant's approach-Prandtl's approach - Torsion of thin walled open and closed sections & thermal stress..					
Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert.					
Text Books					
1. Advanced Mechanics of Materials - F. B. Seely and J. O. Smith. John Wiley and Sons Inc, 2nd edition, 1952.					
2. Advanced Mechanics of Materials, 4 th edition A. P. Boresi and O. M. Sidebottom. John Wiley and Sons, 1985.					
3. Advanced Mechanics of Solids - L. S. Srinath. Tata Mc-Graw Hill Co., 2005					



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
Accredited by NAAC with a CGPA of 3.28/4 at A Grade
Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

Subject Code	Subject Name	L	T	P	C
MMDES1150	ENGINEERING SOFTWARE LAB	3	1		4
SYLLABUS					
C,C++,MAT LAB,AUTOCAD,PRO-E,CATIA,MASTERCAM,UNIGRAPHICS,SOLID WORKS,ANSYS,IRONCAD,MS PROJECT					



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
 Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
 Accredited by NAAC with a CGPA of 3.28/4 at A Grade
 Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

II SEMESTER

Sl. No.	Course Category	Course Code	Course Title	L	T	P	C
THEORY							
1	PC	MMDPC2010	Mechanics of Composite Materials	3	1	0	4
2	PC	MMDPC2020	Experimental Stress Analysis	3	1	0	4
3	PE-3	MMDPE2031	Finite Element Method	3	0	0	3
		MMDPE2032	Computer Graphics and Visualization				
		MMDPE2033	Basic Mechanical Handling Systems				
		MMDPE2034	Analysis and Synthesis of Mechanism				
5	PE-4	MMDPE2041	Bearing and Lubrication	3	0	0	3
		MMDPE2042	Robotics				
		MMDPE2043	Machine Tool Design				
		MMDPE2044	Advanced Gear Engineering				
PRACTICAL							
7	ES	MMDES2150	Advanced Design Engineering Lab	0	0	8	4
TOTAL				12	2	8	18



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
 Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
 Accredited by NAAC with a CGPA of 3.28/4 at A Grade
 Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

Subject Code	Subject Name	L	T	P	C
MMDPC2021	MECHANICS OF COMPOSITE MATERIALS	3	1		4
SYLLABUS					
<p>UNIT:1 (14 Hours) Introduction – Definition & classification of composites; Reinforcing fibers-Types, Characteristics & Selection; Natural fibers, Boron; Carbon; Ceramic; Glass; Armids; Particulate fillers; Matrices-Polymer; Graphite; Ceramic & Metal matrices; Fiber surface treatments; Fillers & additives; Fiber content; Short & continuous fiber reinforced composites. Processing – Pultrusion; Filament winding; Pre-page technology; Injection & compression moulding; Bag moulding; Resin transfer moulding; Other manufacturing processes.</p>					
<p>UNIT:2 (15 Hours) Processing – Pultrusion; Filament winding; Pre-page technology; Injection & compression moulding; Bag moulding; Resin transfer moulding; Other manufacturing processes. Processing of MMC- Diffusion bonding; Stir casting; Squeeze casting. Mechanics – Rule of mixture; Volume & mass fractions; Density & void content; Stress-strain relations for anisotropic materials; Generalized Hook’s law; Stiffnesses, Compliances & engineering constants for orthotropic materials; Stress-strain relations for plane stress in orthotropic materials; Stress-strain relations for a lamina; Characteristics of fiber reinforced lamina.</p>					
<p>UNIT:3 (12 Hours) Analysis – Classical lamination theory; Stress analysis of composite laminates; Failure predictions – Maximum stress theory; Maximum strain theory; Tsai-Hill theory; Modes of failure of composites; First ply failure; Partial ply failure; Total ply failure.</p>					
Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert.					
Text Books					
1. Mechanics of composite materials, R. M. Jones, Mc Graw Hill Book Co. 2. Mechanics of composite materials & structures, M Mukhopadhyay, Universities Press. 3. Fiber-Reinforced composite materials, Manufacturing & Design, P. K. Mallick, Marcel Dekken, Inc. New York & Basel.					



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
Accredited by NAAC with a CGPA of 3.28/4 at A Grade
Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

Subject Code	Subject Name	L	T	P	C
MMDPC2020	EXPERIMENTAL STRESS ANALYSIS	3	1	0	4
SYLLABUS					
UNIT:1 (12 Hours) Electrical Wire Resistance Strain Gauges: Strain sensitivity, strain gauge construction, temperature effects in bonded strain gauges. Gauge factor and gauge sensitivities. Determination of actual strain. Measurement of stress by a strain gauge, stress gauge, strain gauge Rosette. Measuring Circuits: The potentiometer circuit, circuit sensitivity of potentiometer, Wheatstone bridge circuit, Null-balance bridge, strain gauge applications.					
UNIT:2 (13 Hours) Moiré Fringe Method: Moiré method, geometry of moiré fringe, advantages and limitations of moiré method. Photoelasticity: Introduction, basic principle, stress and strain optic law, plane polariscope, circular polariscope, white light illumination.					
UNIT:3 (15 Hours) Analysis Of Photoelastic Data: Materials and properties of material for photoelastic models, stress loci, fractional fringe orders, methods of compensation, calibration techniques, the frozen stress method, Reflection polariscope, separation of principal stresses. Brittle Coating Method: Brittle coating, calibration of coating, application of failure theory to brittle coating, advantages and limitations.					
Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert.					
Text Books 1. J.W. Dally and W.F. Riley, “Experimental stress Analysis”, McGraw Hill, 1991. 2. Durelli, Augusto J., and William Franklin Riley. " Introduction to photomechanics. Prentice-Hall, 1965. 3. L.S.Srinath, M.R.Raghavan, K.Lingaiah, G.Gargesa, B.Pant and K.Ramachandra, “Experimental Stress Analysis, Tata McGraw Hill, 1984.					



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
 Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
 Accredited by NAAC with a CGPA of 3.28/4 at A Grade
 Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

Subject Code	Subject Name	L	T	P	C
MMDPE2031	FINITE ELEMENT METHOD	3	0	0	3

SYLLABUS

UNIT:1 (15 Hours)

1. Introduction: Role of the Computer, General Steps of the Finite Element Method, Applications of the Finite Element Method, Advantages of the Finite Element Method.
2. Introduction to the Stiffness (Displacement) Method: Definition of the Stiffness Matrix, Derivation of the Stiffness Matrix for a Spring Element, Example of a Spring Assemblage, Assembling the Total Stiffness Matrix by Superposition (Direct Stiffness Method), Boundary Conditions, Potential Energy Approach to Derive Spring Element Equations.
3. Development of Truss Equations: Derivation of the Stiffness Matrix for a Bar Element in Local Coordinates, Selecting Approximation Functions for Displacements, Transformation of Vectors in Two Dimensions, Global Stiffness Matrix, Computation of Stress for a Bar in the x-y Plane, Solution of a Plane Truss.
4. Energy Approach to Derive Bar Element Equations: Potential Energy Approach to Derive Bar Element Equations, Comparison of Finite Element Solution to Exact Solution for Bar, Galerkin's Residual Method and Its Use to Derive the One-Dimensional Bar Element Equations, Other Residual Methods and Their Application to a One-Dimensional.

UNIT:2 (15 Hours)

5. Development of Beam Equations: Derivation of the Beam Stiffness matrices, Distributed Loading, Potential Energy Approach to Derive Beam Element Equations, Galerkin's Method for Deriving Beam Element Equations.
6. Development of the Plane Stress and Plane Strain Stiffness Equations: Basic Concepts of Plane Stress and Plane Strain, Derivation of the Constant-Strain Triangular Element Stiffness Matrix and Equations, Treatment of Body and Surface Forces.
7. Development of the Linear-Strain Triangle Equations: Derivation of the Linear-Strain Triangular Element Stiffness Matrix and Equations.
8. Axisymmetric Elements: Derivation of the Stiffness Matrix, Solution of an Axisymmetric Pressure Vessel, Applications of Axisymmetric Elements.

UNIT:3 (12 Hours)

9. Isoparametric Formulation: Isoparametric Formulation of the Bar Element Stiffness Matrix, Rectangular Plane Stress Element, Gaussian and Newton-Cotes Quadrature (Numerical



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
Accredited by NAAC with a CGPA of 3.28/4 at A Grade
Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

Integration), Evaluation of the Stiffness Matrix and Stress Matrix by Gaussian Quadrature.

10. Three-Dimensional Stress Analysis: Three-Dimensional Stress and Strain, Tetrahedral Element.

11. Plate Bending Element: Basic Concepts of Plate Bending, Derivation of a Plate Bending Element Stiffness Matrix and Equations.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert.

Text Books

1. Finite Element Method: Its Basis and Fundamentals. O. C. Zienkiewicz, R. L. Taylor and J. Z. Zhu. Elsevier, 2005.

2. Finite Element Methods – J. N. Reddy. Tata Mc GrawHill.

3. Introduction to the Finite Element Method – C. S. Desai and J. F. Abel. East West Pvt. Ltd., 1972.



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
Accredited by NAAC with a CGPA of 3.28/4 at A Grade
Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

Subject Code	Subject Name	L	T	P	C
MMDPE2032	COMPUTER GRAPHICS AND VISUALIZATION	3	0	0	3
SYLLABUS					
UNIT:1 (14 Hours) Raster graphics and volume graphics. Video basics. Display devices and interactive devices; 2-D and 3-D graphics primitives. Clipping in 2-D and 3-D; Generation and projection of 3-D wire frame solid models, polygonal models. Space curves and surface models. Intersection of surfaces and blending; hidden line and hidden surface elimination algorithms. Ray-surface intersection and inverse mapping algorithms. Ray tracing for photo realistic rendering. Illumination models. Shading, Transparency, Shadowing and Texture mapping; Representation of colours.					
UNIT:2 (13 Hours) Visualization of experimental and simulated data. Surface construction from scattered data, 3-D data arrays and 2-D cross sections. Elevation maps, topological maps, contour maps and intensity maps; fractals for visualization of complex and large data sets. Algebraic stochastic and Geometrical fractals. Modeling of natural forms and textures using fractals; Visualization of multi variate relations . Flow visualization and hyper streamlines; visualization of Metrological, cosmological, seismic, biological data for scientific decision making.					
UNIT:3 (13 Hours) Animation, Modeling issues in dynamic visualization. Behavioral animation; walk through coordinate transformation and view transformation; virtual reality interfaces. Interactive and immersive systems for prototyping and visualization; Visualization in concurrent engineering. Interactive multimedia technology and standards for VideoGraphics-Audio integration and tele-video conferencing					
Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert.					
Text Books 1. CAD/CAM : Computer-Aided Design and Manufacturing - M. P. Groover and E.W. Zimmer, PHI, 1995					



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
 Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
 Accredited by NAAC with a CGPA of 3.28/4 at A Grade
 Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

Subject Code	Subject Name	L	T	P	C
MMDPE2033	BASIC MECHANICAL HANDLING SYSTEMS	3	0	0	3
SYLLABUS					
<p>UNIT:1 (15 Hours) Elements of Material Handling System:- Importance, terminology, objectives and benefits of better Material Handling; Principles and features of Material Handling System; Interrelationships between material handling and Plant layout, physical facilities and other organizational functions; Classification of Material Handling equipments. Selection of Material Handling Equipments:- Factors affecting for selection; Material Handling equation; choices of Material Handling equipment; general analysis procedures; basic analytical techniques; the unit load concept; selection of suitable types of systems for applications; activity cost data and economic analysis for design of components of Material Handling Systems; functions and parameters affecting service; packing and storage of materials.</p>					
<p>UNIT:2 (14 Hours) Conveyors: Belt Conveyors – characteristics, types, components, basic design considerations; Chain Conveyors – characteristics, types, components, aspects of design; Roller Conveyors- characteristics, types, components, aspect of design; Screw conveyors – characteristics, types, components, aspects of design.</p>					
<p>UNIT:3 (13 Hours) Design of Mechanical Handling Equipments:- Design of Hoists:- Drives for hoisting, components, and hoisting mechanisms; rail traveling components and mechanisms; hoisting gear operation during transient motion; selecting the motor rating and determining breaking torque for hoisting mechanisms. Design of Cranes:- Hand-propelled and electrically driven EOT overhead traveling cranes; Traveling mechanisms of cantilever and monorail cranes; design considerations for structures of rotary Cranes with fixed radius; fixed post and overhead traveling cranes; Stability of stationary Rotary and traveling rotary cranes.</p>					
Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert.					
Text Books					
1. Material Handling Equipments - N. Rudenko. Envee Publishers, ND, 1978. 2. Conveying Machines (Vol I & II) - A.O.Spivakovsky, & V.K. Dyachkav. MIR Publication 3. Mechanical Engg Design - J.E.Shiegly. Mc-Graw Hill Book Co., 1986.					



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
 Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
 Accredited by NAAC with a CGPA of 3.28/4 at A Grade
 Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

4. Design of Machine Elements - M.F. Spotts and T.E. Shoup. PHI, 1998.

Subject Code	Subject Name	L	T	P	C
MMDPE2034	ANALYSIS AND SYNTHESIS OF ADVANCED MECHANISM	3	0	0	3
SYLLABUS					
UNIT:1		(13 Hours)			
Basic concepts of kinematics and mechanisms-type, number and dimensions, kinematic pairs, chains and inversions, accuracy point and error analysis, velocity and acceleration analysis of different complex mechanism (I, II & III), gross motion in the 4-bar mechanisms.					
UNIT:2		(15 Hours)			
static and dynamic force analysis of mechanisms; Synthesis of coordinated positions, synthesis of mechanism to trace a curve or path generation, synthesis for function generation; Dimensional synthesis, method of approach and optimization of a solution; Equivalent and conjugate linkages, four bar chains, copular curves, Robert's Law chebycheve's polynomials, path curvature Euler - Savary equation, Polode curvature. ; Planer and spatial problems, graphical and analytical methods, finite displacements, analytical design of 4-bar mechanisms for coordinated motion.					
UNIT:3		(14 Hours)			
Cams: synthesis of cam profiles, advanced cam curves, dynamic analysis, accuracy analysis and design of cams; Gears andgyroscopes: Elements of different secondary space curves, conjugate action, general mechanism, non circular sensors , dynamics of gears, Gyro-dynamics, gyroscopic actions in machines.					
Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert.					
Text Books					
1. R.S. Hartenberg and J. Denavit, “Kinematic Synthesis of Linkages”, McGraw-Hill, New York, 1980.					
2. Robert L. Norton , "Design of Machinery', Tata McGraw Hill Edition					
3. A. Ghosh & A.K. Mallik, Theory of Mechanism And Machines, Affiliated East-West Press: 1998					



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
 Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
 Accredited by NAAC with a CGPA of 3.28/4 at A Grade
 Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

Subject Code	Subject Name	L	T	P	C
MMDPE2041	BEARING AND LUBRICATION	3	0	0	3
SYLLABUS					
<p>UNIT:1 (14 Hours) FRICITION and WEAR: Friction - Laws of friction - Friction classification - Causes of friction, Theories of Dry Friction, Friction Measurement, Stick-Slip Motion and Friction Instabilities, Wear - Wear classification - Wear between solids - Wear between solid and liquid - Factors affecting wear - Measurement of wear, Theories of Wear, Approaches to Friction Control and Wear Prevention, Boundary Lubrication, Bearing Materials and Bearing Construction. Selection of rolling element bearings: Nominal life, static and dynamic capacity - Equivalent load, probabilities of survival - cubic mean load - bearing mounting details, pre loading of bearings, conditioning monitoring using shock pulse method.</p>					
<p>UNIT:2 (14 Hours) Hydrodynamic bearings: Fundamentals of fluid formation – Reynold’s equation; Hydrodynamic journal bearings – Sommerfield number - performance parameters – optimum bearing with maximum load capacity – Friction – Heat generated and Heat dissipated. Hydrodynamic thrust bearings; Raimondi and Boyd solution for hydrodynamic thrust bearings - fixed tilting pads, single and multiple pad bearings - optimum condition with largest minimum film thickness. Hydrostatic Bearings: Thrust bearings – pad coefficients - restriction - optimum film thickness - journal bearings – design procedure –Aerostatic bearings; Thrust bearings and Journal bearings – design procedure.</p>					
<p>UNIT:3 (14 Hours) Dry rubbing Bearings: porous metal bearings and oscillatory journal bearings – qualitative approach only. Lubrication: Choice of lubricants, types of oil, Grease and solid lubricants - additives - lubrication systems and their selection – selection of pump, filters, piping design - oil changing and oil conservation.</p>					
Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert.					
Text Books					
<ol style="list-style-type: none"> 1. Introduction to Tribology of Bearings - B.C.Majumdar, Wheeler Publication, 1999. 2. Lubrication of bearing by E. I. Radzimogky (John Willey) 					



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
Accredited by NAAC with a CGPA of 3.28/4 at A Grade
Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

3. Lubrication in Practice by W. L. Robertson (CRC)

Subject Code	Subject Name	L	T	P	C
MMDPE2042	ROBOTICS	3	0	0	3
SYLLABUS					
UNIT:1 (14 Hours)					
<p>Fundamentals of Robotics: Introduction Automation & Robotics robot applications robotic systems, robot anatomy and robot configurations, Joint types used in robots, robot wrists, joint notation schemes, work value for various robot anatomies, robot specifications, introduction to robot arm dynamics.</p> <p>Robots end-effectors-classification of end-effectors, mechanical grippers, hooking or lifting grippers, grippers for molten metal's, plastics, vacuum cups, magnetic grippers, electrostatic grippers, multiple grippers, internal & external grippers, drive systems for grippers, active & passive grippers.</p>					
UNIT:2 (14 Hours)					
<p>Robot Kinematics - Forward & reverse kinematics, forward and reverse transformation of two DOF & three DOF 2-D manipulator, homogeneous transformations. Robot drives & control-pneumatic power drives, hydraulic systems, electric drives, robot controllers-servo and non servo systems, motion control of robots, point to point and continuous path control, teaching of robots, robot programming methods. Basic control system models, slew motion, joint-interpolated motion and straight line motion.</p> <p>Robot Sensors: Scheme of robotic sensors, contact type sensors, force, torque, touch, position, velocity sensors, non-contact type sensors, electro-optical imaging sensors, proximity sensors, range imaging sensors, robot environment and robot input/output interfaces, machine intelligence, safety measures in robots.</p>					
UNIT:3 (14 Hours)					
<p>Robot cell layouts, multiple robots and machine interface, other considerations in work cell design, work cell control, interlocks, error detection and recovery, work cell controller, robot cycle time analysis.</p> <p>Quantitative Techniques for economic performance of robots: Robot investment coats, robot operating expenses. General considerations in robot material handling, material transfer applications, pick and place operations, palletizing and related operations, machine loading and unloading, die casting, plastic moulding, forging, machining operations, stamping press</p>					



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
Accredited by NAAC with a CGPA of 3.28/4 at A Grade
Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

operations using robots.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert.

Text Books

1. Robotics Technology & Flexible Automation, S. R. Deb, Tata McGraw Hill.
2. Industrial Robotics, M. P. Groover, McGraw Hill.
3. Robotics for Engineers, Y. Koren, McGraw Hill.



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
 Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
 Accredited by NAAC with a CGPA of 3.28/4 at A Grade
 Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

Subject Code	Subject Name	L	T	P	C
MMDPE2043	MACHINE TOOL DESIGN	3	0	0	3
SYLLABUS					
<p>UNIT:1 (14 Hours) Introduction to metal cutting machine tools- criteria for the selection of operating capacity and design parameters, kinematics of machine tools. Basic principles of machine tool design, estimation of drive power, machine tool drives, electrical, mechanical and fluid drives, stepped and step less speed arrangements and systems.</p>					
<p>UNIT:2 (12 Hours) Design of machine tool spindles and bearings, design of power screws, design of slide ways, selective and pre-selective mechanisms. Machine tool structures-beds, columns, tables and supports, stock feed mechanism, Measurement and control of machine tools, protective and safety devices, design of precision machine tools.</p>					
<p>UNIT:3 (14 Hours) Micro-feeding mechanisms, concept of modular design and integration of SPM's, Concepts of aesthetic and ergonomics applied to machine tools. Acceptance tests standardization of machine tools, machine tool conditioning, latest trends in machine tool design, Introduction to CAD techniques.</p>					
Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert.					
Text Books 1. N. K.Mehta , Machine tool design, Tata Mcgraw-hill, New Delhi, 1989. 2. N.Acherkan, Machine tool design, Vol. 3 and 4, Mir publisher, Moscow, 1968.					



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
 Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
 Accredited by NAAC with a CGPA of 3.28/4 at A Grade
 Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

Subject Code	Subject Name	L	T	P	C
MMDPE2044	ADVANCED GEAR ENGINEERING	3	0	0	3
SYLLABUS					
UNIT:1		(14 Hours)			
<p>Introduction: Principles of gear tooth action, Generation of Cycloid and Involute gears, Involutometry, gear manufacturing processes and inspection, gear tooth failure modes, stresses, selection of right kind of gears.</p> <p>Spur Gears : Tooth loads, Principles of Geometry, Design considerations and methodology, Complete design of spur gear teeth considering Lewis beam strength, Buckingham’s dynamic load and wear load, Design of gear shaft and bearings. Helical Gears: Tooth loads, Principles of Geometry, Design considerations and methodology, Complete design of helical gear teeth considering Lewis beam strength, Buckingham’s dynamic load and wear load, Design of gear shaft and bearings.</p>					
UNIT:2		(14 Hours)			
<p>Bevel Gears: Tooth loads, Principles of Geometry, Design considerations and methodology, Complete design of bevel gear teeth considering Lewis beam strength, Buckingham’s dynamic load and wear load, Design of gear shaft and bearings.</p> <p>Worm Gears: Tooth loads, Principles of Geometry, Design considerations and methodology, Complete design of worm gear teeth considering Lewis beam strength, Buckingham’s dynamic load and wear load, Heat dissipation considerations. Design of gear shaft and bearings. Gear failures: Analysis of gear tooth failures, Nomenclature of gear tooth wear and failure, tooth breakage, pitting, scoring, wear, overloading, gear-casing problems, lubrication failures</p>					
UNIT:3		(14 Hours)			
<p>Gear trains: Simple, compound and epicyclic gear trains, Ray diagrams, Design of a gear box of an automobile, Design of gear trains from the propeller shafts of airplanes for auxiliary systems.</p> <p>Optimal Gear design: Optimization of gear design parameters, Weight minimization, Constraints in gear train design-space, interference, strength, dynamic considerations, rigidity etc. Compact design of gear trains, multi objective optimization of gear trains. Application of Traditional and non-traditional optimization techniques</p>					



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
Accredited by NAAC with a CGPA of 3.28/4 at A Grade
Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert.

Text Books

1. Maleev and Hartman, Machine Design, C.B.S. Publishers, India.
2. Henry E.Meritt, Gear engineering, Wheeler publishing, Allahabad, 1992.

Subject Code	Subject Name	L	T	P	C
MMDES2150	ADVANCED DESIGN ENGINEERING LAB	3	0	0	3
SYLLABUS					
1. (a) Tensile Test (UTM) (b) Compression Test 2. Izod and Charpy Tests 3. Fatigue Test 4. Hardness Test 5. Vibration Mode Shape Study and determination of damping coefficient 6. Experiment on vibration meter. 7. Measurement of component strain by using strain rosette 8. Measurement of strain by strain gauge 9. Study of bearings and bearings characteristics (Journal bearing and Roller bearing) 10. Calibration of LVDT using Indicator/CRO.					



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
 Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
 Accredited by NAAC with a CGPA of 3.28/4 at A Grade
 Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

III SEMESTER

Sl. No.	Course Category	Course Code	Course Title	L	T	P	C
THEORY							
1	OE	MMDOE3011	Research Methodology	3	0	0	3
		MMDOE3012	Human Resource Management				
		MMDOE3013	Project Management And Costing				
2	PE	MMDPE3021	Machine Fault Diagnosis And Signal Processing	3	0	0	3
		MMDPE3022	Mechatronics				
		MMDPE3023	Mechanical Drives				
		MMDPE3024	Dynamics Of Rotors				
3	ES	MMDES3130	Dissertation Phase-I	0	0	20	10
TOTAL				6	0	20	16



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
 Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
 Accredited by NAAC with a CGPA of 3.28/4 at A Grade
 Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

Subject Code	Subject Name	L	T	P	C
MMDOE3011	RESEARCH METHODOLOGY	3	0	0	3
SYLLABUS					
UNIT:1		(14 Hours)			
Introduction to RM: Meaning and significance of research. Importance of scientific research in decision making. Types of research and research process. Identification of research problem and formulation of hypothesis. Research Designs. Measurement and Data Collection. Primary data, Secondary data, Design of questionnaire; Sampling fundamentals and sample designs. Measurement and Scaling Techniques, Data Processing.					
UNIT:2		(14 Hours)			
Data Analysis – I: Hypothesis testing; Z-test, t-test, F-test, Chi-square test. Analysis of variance. Non-parametric Test – Sign Test, Run test, Krushall – Wallis test					
UNIT:3		(12 Hours)			
Data Analysis – II: Factor analysis, Multiple Regressions Analysis. Discriminant Analysis, Use of SPS Package.					
Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert.					
Text Books					
1. Research Methodology, Chawla and Sondhi, Vikas					



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
 Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
 Accredited by NAAC with a CGPA of 3.28/4 at A Grade
 Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

Subject Code	Subject Name	L	T	P	C
MMDOE3012	HUMAN RESOURCE MANAGEMENT	3	0	0	3
SYLLABUS					
UNIT:1		(14 Hours)			
Human Resource Development Strategies, Design And Experience					
Human Resource Development: HRD-An Overview, Line Managers and HRD, Task Analysis, Motivational Aspects of HRD, Developmental Supervision, Counselling and Mentoring, HRD for Health and Family Welfare in Select HRD Culture and Climate, HRD for Workers, HRD/OD Approach to IR Corporate Business.					
UNIT:2		(12 Hours)			
Basics of Human Resource Planning					
Macro Level Scenario of Human Resource Planning, Concepts and Process of Human Resource Planning, Methods and Techniques-Demand Forecasting, Methods and Techniques-Supply Forecasting, Job Evaluation: Concepts, Scope and Limitations, Selection and Recruitment, Induction and Placement, Performance and Potential Appraisal, Transfer, Promotion and Reward Policies, Training and Retraining.					
UNIT:3		(14 Hours)			
Wage and Salary Administration & Labour Legislation					
Wage Concepts and Definition of Wages Under Various Labour Legislation, Norms for Wage Determination, Law relating to Payment of Wages and Bonus, Pay Packet Composition, Design of Performance-linked Reward System,					
Philosophy of Labour Laws, Labour Laws, Industrial Relations and Human Resource Management, Indian Constitution and Labour Legislations					
Time Management: Importance of Time factor, Time waster, Prioritizing Work Scheduling, Functions of the Time Office, Flexible Work arrangements.					
Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert.					
Text Books					
1. Beardwell and Len Holder, Human Resource Management Macmillan India Ltd.,					



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
 Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
 Accredited by NAAC with a CGPA of 3.28/4 at A Grade
 Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

2. Graham H.T., & R.Bennet, Human Resource Management – Pitman, London
--

Subject Code	Subject Name	L	T	P	C
MMDOE3013	PROJECT MANAGEMENT AND COSTING	3	0	0	3
SYLLABUS					
UNIT:1		(10 Hours)			
Project Feasibility Analysis: Technical feasibility, commercial and financial viability, Environment Analysis.					
Project Engineering: Project Management Techniques: PERT, CPM, Project Scheduling Crashing, PERT / COST, LOB.					
UNIT:2		(14 Hours)			
Projects Financing alternatives, Sources of finance, their advantages, Choice of Financing mix, Capital budgeting.					
Costing: Fixed and variable cost. Break even analysis, Overhead allocation Techniques.					
UNIT:3		(16 Hours)			
Project Organisation, management and control: Project organisation and control staffing, monitoring: cost, time and control and progress monitoring techniques.					
Product and service pricing: Availability and quality-based pricing for services.					
Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert.					
Text Books					
1. Prasanna Chandra: Project Engineering and Management, Prentice Hall					



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
Accredited by NAAC with a CGPA of 3.28/4 at A Grade
Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

Subject Code	Subject Name	L	T	P	C
MMDPE3021	MACHINE FAULT DIAGNOSIS AND SIGNAL PROCESSING	3	0	0	3
SYLLABUS					
UNIT:1		(12 Hours)			
Introduction. Maintenance Principles. Basics of Machine Vibration. Signal Analysis. Computer based data acquisition. Time domain Signal analysis.					
UNIT:2		(12 Hours)			
Introduction to MATLAB. Signal Processing Exercises with MATLAB. Fault detection transducers and instrumentation. Vibration monitoring. In- Situ field balancing of rotors. Condition monitoring of rotating machines. Noise monitoring.					
UNIT:3		(12 Hours)			
Wear and debris analysis. Thermography. Electrical Motor Current Signature Analysis. Ultrasonics in Condition Monitoring. NDT Techniques in Condition monitoring.					
Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert.					
Text Books					
1. Introduction to Machinery Analysis and Monitoring – J. S. Mitchell. Pennwell Publishers.					



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
 Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
 Accredited by NAAC with a CGPA of 3.28/4 at A Grade
 Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

Subject Code	Subject Name	L	T	P	C
MMDPE3022	MECHATRONICS	3	0	0	3
SYLLABUS					
<p>UNIT:1 (14 Hours)</p> <p>1.Introduction: Definition of mechatronics, measurement system, control systems, microprocessor-based controllers, mechatronics approach.</p> <p>2.Sensors and Transducers: Sensors and transducers, performance terminology, photoelectric transducers, flow transducers, optical sensors and transducers, semiconductor lasers, selection of sensors, mechanical / electrical switches, inputting data by switches.</p> <p>3. Actuators: Actuation systems, pneumatic and hydraulic systems, process control valves, rotary actuators, mechanical actuation systems, electrical actuation systems.</p>					
<p>UNIT:2 (12 Hours)</p> <p>4.Signal Conditioning: Signal conditioning, filtering digital signal, multiplexers, data acquisition, digital signal processing, pulse modulation, data presentation systems.</p> <p>5.Microprocessors and Microcontrollers: Microcomputer structure, microcontrollers, applications, programmable logic controllers.</p>					
<p>UNIT:3 (14 Hours)</p> <p>6.Modeling and System Response: Mathematical models, mechanical, electrical, hydraulic and thermal systems, dynamic response of systems, transfer function and frequency response, closed loop controllers.</p> <p>7.Design and Mechatronics: Input/output systems, computer based modular design, system validation, remote monitoring and control, designing, possible design solutions, detailed case studies of mechatronic systems used in photocopier, automobile, robots.</p>					
Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert.					
Text Books					
1. Bolton, W., “Mechatronics”, Longman, 1999. 2. Bolton, W., “Mechatronics: A Multidisciplinary Approach”, 4th Ed., Prentice Hall, 2009. 3. Mahalik, N., “Principles, Concept and Applications: Mechatronics”, Tata McGraw, 2003.					



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
 Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
 Accredited by NAAC with a CGPA of 3.28/4 at A Grade
 Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

Subject Code	Subject Name	L	T	P	C
MMDPE3023	MECHANICAL DRIVES	3	0	0	3
SYLLABUS					
UNIT:1		(14 Hours)			
Design of Keys, Shaft and Couplings: Classification of keys and pins, Design of keys and pins, Theories of failure, Design of shafts: based on strength, torsional rigidity and fluctuating load, ASME code for shaft design. Design of Coupling: Types of shaft coupling, design of flange coupling, flexible bush coupling. Design of Mechanical Springs: Types of helical springs, Design of Helical springs, bulking of spring, spring surge, end condition of springs, Design of leaf springs: nipping.					
UNIT:2		(14 Hours)			
Design of Flywheel: Functions, Coefficient of fluctuation of energy and Coefficient of fluctuation of speed, energy storage in flywheel, stresses in flywheel, design of flywheel. Design of clutch: Friction clutch, Cone clutch and Centrifugal clutch, Design of Brake : Block & Band brake, Internal expanding shoe brake. Design of Gears: Review of kinematics of gears & terminology, interference, tooth profiles, formative number of teeth etc. Design of Spur Gear drive, Helical Gear drive.					
UNIT:3		(12 Hours)			
Design of Bevel Gear Drive: Types of bevel gear, proportions of bevel gear, force analysis of bevel gear drive, design of bevel gear drive. Design of Worm Gear Drive: Worm Gearing—AGMA Equation; Worm-Gear force analysis Designing a Worm-Gear Mesh; Buckingham Wear Load.					
Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert.					
Text Books					
1. Machine Design, Maleev & Hartman, CBS publishers.					
2. Machine Design, P.H. Black, TMH.					
3. Mechanical Engg. Design, Shigley, TMH.					



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
 Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
 Accredited by NAAC with a CGPA of 3.28/4 at A Grade
 Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)

Subject Code	Subject Name	L	T	P	C
MMDPE3024	DYANAMICS OF ROTORS	3	0	0	3
SYLLABUS					
UNIT:1		(14 Hours)			
Rudiments of Rotor Dynamics, Rotor Dynamic considerations in machinery design, critical speeds and unbalance response. Factors affecting them such as gyroscopic action, internal damping, fluid film bearings. Methods for analysis such as Transfer Matrix, FEM etc.					
UNIT:2		(12 Hours)			
Vibration of Discs, disc gyroscopics, synchronous and non synchronous whirl, analysis of rotors mounted on hydrodynamic bearings, application to two spool and multispool rotors.					
UNIT:3		(12 Hours)			
Analysis of asymmetric shafts. Parametric excitation and instability due to fluid film forces and hysteresis. Effect of support nonlinearities. Rigid rotor balancing. Torsional vibration. Balancing of rotors. Concepts of condition monitoring.					
Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert.					
Text Books					
1. Rotor Dynamics – J. S. Rao. New Age International Publications, 3rd Edition.					



GIET MAIN CAMPUS AUTONOMOUS GUNUPUR 765022
Approved by AICTE, Govt. of Odisha and Affiliated to BPUT, Rourkela, Odisha
Accredited by NAAC with a CGPA of 3.28/4 at A Grade
Dist.- Rayagada, Odisha, INDIA; www.giet.edu
DEPARTMENT OF MECHANICAL ENGINEERING
M.TECH – MACHINE DESIGN (R-2018)