J.B. INSTITUTE OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE STRUCTURE AND SYLLABUS

M. Tech. (CAD/CAM) 2018-2019 Admitted Batch (R18)

I SEMESTER

S. NO.	Course Code	Course Title	L	P	Credits
1	GM11A	**Core Course- I**	3	-	3
		Advanced CAD			
2	GM11B	**Core Course- II**	3	-	3
		Advanced Computer Aided Manufacturing			
3		**Program Elective- I**	3	-	3
	GM11C	Mechanical Behaviour of Materials			
	GM11D	Stress Analysis and Vibration			
	GM11E	Rapid Prototyping Technologies			
4		**Program Elective- II**	3	-	3
	GM11F	Automation in Manufacturing			
	GM11G	Computer Aided Process Planning			
	GM11H	Advanced FEM			
5	GM11I	Advanced CAD Lab	-	3	2
6	GM11J	Advanced CAM Lab	-	3	2
7	GM11K (Core)	Research Methodology & Intellectual Property Rights	2	-	2
8	GM11L Audit Course- I	Disaster Management	2	-	-
Total Credits					**18**

II SEMESTER

S. NO.	Course Code	Course Title	L	P	Credits
1	GM12A	**Core Course- III** Manufacturing Systems, Simulation modeling & Analysis	3	-	3
2	GM12B	**Core Course- IV** Precision Engineering	3	-	3
3		**Program Elective- III**	3	-	3
	GM12C	Intelligent Manufacturing Systems			
	GM12D	Special Manufacturing Process			
	GM12E	Optimization Techniques & Applications			
4		**Program Elective- IV**	3	-	3
	GM12F	Advanced Mechatronics			
	GM12G	Design and Manufacturing of MEMS and Micro systems			
	GM12H	Design for Manufacturing & Assembly			
5	GM12I	Simulation of Manufacturing Systems Lab	-	3	2
6	GM12J	Precision Engineering Lab	-	3	2
7	GM12K	Mini Project	-	4	2
8	GM12L Audit Course -II	Personality Development through Life Enlightenment Skills.	2	-	-
Total Credits					**18**

III SEMESTER

S. NO.	Course Code	Course Title	L	P	Credits
1		**Program Elective- V**	3	-	3
	GM13A	Mechanics of Composite Materials			
	GM13B	Advanced Industrial Robotics			
	GM13C	Production and Operation Management			
2		**Open Elective**	3	-	3
	GM1OA	Nano Technology			
	GM1OB	Industrial Safety			
3	GM13D Dissertation	Dissertation Phase-I	-	-	10
Total Credits					**16**

IV SEMESTER

S. NO.	Course Code	Course Title	L	P	Credits
1	GM14A Dissertation	Dissertation Phase-II	-	-	**16**
Total Credits					**16**

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY

UGC AUTONOMOUS

M. Tech.: CAD/CAM	L	P	C
I Year –I Semester	3	-	3

(GM11A) ADVANCED CAD

(Core Course - I)

UNIT- I:

CAD Tools: Definition of CAD Tools, Graphics standards, Graphics software: requirements of graphics software, Functional areas of CAD, Efficient use of CAD software.

Basics of Geometric Modelling: Requirement of geometric modelling, Geometric models, Geometric construction methods, and modelling facilities desired.

UNIT- II:

Geometric Modelling: Classification of wireframe entities, Curve representation methods, Parametric representation of analytic curves: line, circle, arc, conics.

Parametric representation of synthetic curves: Hermite cubic curve, Bezier curve, B-Spleen curve wire, NURBS, Curvemanipulations.

UNIT- III:

Surface Modeling: Classification of surface entities, Surface representation methods, parametric representation of analytic surfaces: plane surface, ruled surface, surface of revolution, tabulated cylinder.

Parametric representation of synthetic surfaces: Hermite cubic surface, Bezier surface, B- Spleen surface, Blending surface, Surface manipulations.

UNIT- IV:

Solid Modelling: Geometry and topology, Boundary representation, The Euler-Poincare formula, Euler operators.

Constructive solid geometry: CSG primitives, Boolean operators, CSG expressions, Interior, Exterior, closure, Sweeping: linear and non-linear, Solid manipulations.

UNIT- V:

Transformations: 2-D and 3-D transformations: translation, scaling, rotation, reflection, concatenation, homogeneous coordinates, Perspective projection, orthotropic projection, isometric projection, Hidden surface removal, shading, rendering.

Evaluation Criteria: Evaluation criteria of CAD software, Data exchange formats: GKS, IGES, PHIGS, CGM, and STEP. Dimensioning and tolerances: Linear, angular, angular dimensions, maximum material condition (MMC), least material condition (LMC), Regardless of feature size (RFS)

TEXT BOOKS:

1. CAD/CAM Concepts and Applications/Alavala/PHI.
2. Mastering CAD/CAM / Ibrhim Zeid / McGraw Hill International

REFERENCES:

1. CAD/CAM Principles & applications/P.N.Rao/TMH/3rdEdition
2. CAD/CAM /Groover M.P./Pearson education
3. CAD / CAM / CIM, Radhakrishnan and Subramanian/NewAge
4. Principles of Computer Aided Design and Manufacturing/ Farid Amirouche /Pearson
5. Computer Numerical Control Concepts and programming/ Warren SSeames/Thomson.

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
UGC AUTONOMOUS

M. Tech.: CAD/CAM	L	P	C
I Year –I Semester	3	-	3

(GM11B) ADVANCED COMPUTER AIDED MANUFACTURING

(Core Course - II)

UNIT - I

Computer-Aided Programming: General information, APT programming, Examples Apt programming problems (2D machining only). NC programming on CAD/CAM systems.

Design and implementation of post processors, Introduction to CAD/CAM software, Automatic Tool path generation

UNIT - II

Tooling for CNC Machines: Interchangeable tooling system, preset and qualified tools, coolant fed tooling system, modular fixturing, and quick change tooling system.

Automatic head changers, automatic pallet change, Automatic pallet storage and tool re-setting system

UNIT - III

Post Processors for CNC: Introduction to Post Processors: The necessity of a Post Processor, the general structure of a Post Processor, the functions of a Post Processor.

DAPP based Post Processor: Communication channels and major variables in the DAPP — based Post Processor, the creation of a DAPP — Based Post Processor.

UNIT - IV

Micro Controllers: Introduction, Hardware components, I/O pins, ports, external memory:, counters, timers and serial data I/O interrupts. Selection of Micro Controllers Embedded Controllers, Applications and Programming of Micro Controllers.

Programming Logic Controllers (PLC' s): Introduction, Hardware components of PLC, System, basic structure, principle of operations, Programming mnemonics timers, Internal relays and counters, Applications of PLC's in CNC Machines.

UNIT - V

Computer Aided Process Planning: Hybrid CAAP System, Computer Aided Inspection and quality control, Coordinate Measuring Machine, Limitations of CMM, Computer Aided Testing, and Optical Inspection Methods.

Artificial Intelligence and expert system: Artificial Neural Networks, Artificial Intelligence in CAD, Experts systems andits structures.

TEXT BOOKS:

1. CAD/CAM Concepts and Applications/Alavala/PHI.
2. CAD/CAM Principles and Applications,P.N.Rao,TMH

REFERENCES:

1. Computer Control of Manufacturing Systems / YoramKoren / Mc GrawHill.1983.
2. Computer Aided Design Manufacturing – K. Lalit Narayan, K. Mallikarjuna Rao and M.M.M. Sarcar, PHI, 2008.
3. CAD / CAM / CIM, Radhakrishnan and Subramanian,NewAge
4. Principles of Computer Aided Design and Manufacturing, FaridAmirouche, Pearson
5. Computer Numerical Control Concepts and programming, Warren SSeames,Thomson

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
UGC AUTONOMOUS

M. Tech.: CAD/CAM	L	P	C
I Year –I Semester	3	-	3

(GM11C) MECHANICAL BEHAVIOUR OF MATERIALS

(Program Elective – I)

UNIT-I:

Introduction to Deformation Behaviour: Concept of stresses and strains, engineering stresses and strains, Different types of loading and temperature encountered in applications.

Tensile Test - stress-strain response for metal, ceramic and polymer, elastic region, yield point, plastic deformation, necking and fracture, bonding and Material Behaviour, theoretical estimates of yield strength in metals and ceramics

UNIT-II:

Elasticity Theory: The State of Stress and strain, stress and strain tensor, tensor transformation, principal stress and strain, elastic stress-strain relation, anisotropy, elastic behavior of metals, ceramics and polymers.

Yielding and Plastic Deformation: Hydrostatic and Deviatoric stress, Octahedral stress, yield criteria and yield surface, texture and distortion of yield surface, Limitation of engineering strain at large deformation, true stress and true strain, effective stress, effective strain, flow rules, strain hardening, RambergOsgood equation, stress -strain relation in plasticity, plastic deformation of metals and polymers

UNIT-III:

Microscopic view of plastic deformation: crystals and defects, classification of defects, thermodynamics of defects, geometry of dislocations, slip and glide, dislocation generation - Frank Read and grain boundary sources, stress and strain field around dislocations, force on dislocation - self-stress, dislocation interactions, partial dislocations, twinning, dislocation movement and strain rate.

Deformation behavior of single crystal, critical resolved shear stress (CRSS), deformation of poly-crystals - Hall-Petch and other hardening mechanisms, grain size effect - source limited plasticity, Hall-Petch breakdown, dislocations in ceramics and glasses.

UNIT-IV:

Fracture: fracture in ceramics, polymers and metals, different types of fractures in metals, fracture mechanics - Linear fracture mechanics -KIC, Elasto-plastic fracture mechanics - JIC, Measurement and ASTM standards.

Design based on fracture mechanics, effect of environment, effect of microstructure on KIC and JIC, application of fracture mechanics in the design of metals, ceramics and polymers

UNIT-V:

Deformation under cyclic load - Fatigue: S-N curves, Low and high cycle fatigue, Life cycle prediction, Fatigue in metals, ceramics and polymers

Deformation at High temperature: Time dependent deformation - creep, different stages of creep, creep and stress rupture, creep mechanisms and creep mechanism maps, creep under multi-axial loading, micro-structural aspects of creep and design of creep resistant alloys, high temperature deformation of ceramicsand polymers.

REFERENCES:

1. G.E. Dieter" Mechanical Metallurgy",McGraw-Hill, 1986.
2. R.W. Hertzberg" Deformation and Fracture Mechanics of Engineering Materials", John Wiley andSons, 1976.

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
UGC AUTONOMOUS

M. Tech.: CAD/CAM	L	P	C
I Year –I Semester	3	-	3

(GM11D) STRESS ANALYSIS AND VIBRATION

(Program Elective – I)

UNIT-I:

Two dimensional elasticity theory in Cartesian coordinates.

Plane stress problem in polar coordinates thick cylinders, rotating discs - stress concentration

UNIT- II:

Torsion of non circular prismatic sections, rectangular and axi-symmetric, Circular plates.

Introduction to shell theory — contact stresses

UNIT- III:

Single degree freedom, two degree freedom system without and with damping

Free and forced vibrations. Transient vibrations

UNIT- IV:

Transient vibrations of single and two degree and multi-degree of freedom systems

Applications of matrix methods, continuous systems

UNIT -V:

Free and forced vibrations of strings bars and CAD/CAM

Principle of orthogonality - classical and energy methods

REFERENCES:

1. Theory of Elasticity/Timoshenko S.P. and GoodierJ.N. /Koakusha Publishers
2. Advanced strength of materials / DenHortogJ.P./Torrent
3. Mechanical Vibrations/ Den Ilartog J.P./ DoverPublications
4. Theory of Vibrations with Applications/ Thomson W.T. /CBS Publishing Mechanical Vibrations/ Rao S.S./ Addison Wesley Longman

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
UGC AUTONOMOUS

M. Tech.: CAD/CAM	L	P	C
I Year –I Semester	3	-	3

(GM11E) RAPID PROTOTYPING TECHNOLGIES

(Program Elective – I)

UNIT-I:

Introduction: Prototyping fundamentals, historical development, fundamentals of rapid prototyping, advantages and limitations of rapid prototyping, commonly used terms.

Classification of RP process: rapid prototyping process chain: Fundamental automated processes, process chain.

UNIT – II

Liquid-based Rapid Prototyping Systems: Stereo lithography Apparatus (SLA): Models and specifications, Process, working principle, photopolymers, photo polymerization, Layering technology, laser and laser scanning, Applications, Advantages and Disadvantages, Case studies.

Solid ground curing (SGC): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies

Solid-based Rapid Prototyping Systems: Laminated Object Manufacturing (LOM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Fused Deposition Modeling (FDM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies.

UNIT-III

Powder Based Rapid Prototyping Systems: Selective laser sintering (SLS): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Three dimensional Printing (3DP): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies.

Rapid Tooling: Introduction to Rapid Tooling (RT), Conventional Tooling Vs. RT, Need for RT. Rapid Tooling Classification: Indirect Rapid Tooling Methods: Spray Metal Deposition, RTV Epoxy Tools, Ceramic tools, Investment Casting, Spin Casting, Die casting, Sand Casting, 3D Keltool process. Direct Rapid Tooling: Direct AIM, LOM Tools, DTM Rapid Tool Process, EOS Direct Tool Process and Direct Metal Toolingusing3DP.

UNIT – IV

Rapid Prototyping Data Formats: STL Format, STL File Problems, Consequence of Building Valid and Invalid Tessellated Models, STL file Repairs: Generic Solution, Other Translators, Newly Proposed Formats.

Rapid Prototyping Software's: Features of various RP software's like Magic's, Mimics, Solid View, View Expert, 3 D View, Velocity 2 , Rhino, STL View 3 Data Expert and 3 D doctor.

UNIT –V

RP Applications: Application – Material Relationship, Application in Design , Application in Engineering, Analysis and Planning, Aerospace Industry, Automotive Industry, Jewelry Industry, Coin Industry, GIS application, Arts and Architecture.

RP Medical and Bioengineering Applications: Planning and simulation of complex surgery, Customized Implants & Prosthesis, Design and Production of Medical Devices, Forensic Science and Anthropology, Visualization of Bio-molecules.

TEXT BOOKS:

1. Rapid prototyping: Principles and Applications - Chua C.K., Leong K.F. and LIM C.S, World Scientific publications , Third Edition, 2010.

REFERANCE BOOKS:

1. Rapid Manufacturing – D.T. Pham and S.S. Dimov, Springer, 2001
2. Whalers Report 2000 – Terry Wohlers, Wohlers Associates, 2000

Rapid Prototyping & Manufacturing – Paul F.Jacobs, ASME Press, 1996.

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
UGC AUTONOMOUS

M. Tech.: CAD/CAM	L	P	C
I Year –I Semester	3	-	3

(GM11F) AUTOMATION IN MANUFACTURING

(Program Elective – I)

UNIT-I:

Over View of Manufacturing and Automation: Production systems, Automation in production systems, Automation principles and strategies, Manufacturing operations, production facilities.

Basic elements of an automated system, levels of automation; Hardware components for automation and process control, programmable logic controllers and personal computers

UNIT – II:

Material Handling and Identification Technologies: Material handling, equipment, Analysis.

Storage systems, performance and location strategies, automated storage systems, AS/RS, types, automatic identification methods, Barcode technology, RFID

UNIT – III:

Manufacturing Systems and Automated Production Lines: Manufacturing systems: components of a manufacturing system, Single station manufacturing cells.

Manual Assembly lines, line balancing Algorithms, Mixed model Assembly lines, Alternative Assembly systems. Automated production lines, Applications, Analysis oftransfer lines

UNIT – IV:

Automated Assembly Systems: Fundamentals, Analysis of Assembly systems, cellular manufacturing, part families, cooling and production flow analysis

Group Technology and flexible Manufacturing systems, Quantitative Analysis.

UNIT – V:

Quality Control and Support Systems: Quality in Design and manufacturing, inspection principles and strategies, automated inspection, contact Vs non contact, CMM.

Manufacturing support systems. Quality function deployment, computer aided process planning, concurrent engineering, shop floor control, just in time and lean production.

REFERENCES:

1. Automation,production systems and computer integrated manufacturing / Mikell. P Groover /PHI /3rd edition/2012.
2. Automation, Production Systems and CIM/ Mike P.Grower/PHI
3. CAD/CAM/CIM/ P. Radha Krishnan & S. Subrahamanyarn and Raju/NewAge International Publishers/2003.
4. System Approach to Computer Integrated Design and Manufacturing/Singh/JohnWiley/96
5. Computer Aided Manufacturing/Tien-Chien Chang, Richard A. Wyskand Hsu-PinWang/ Pearson/2009.
6. Manufacturing and Automation Technology / R Thomas Wright and Michael Berkeihiser / GoodHeart/WillcoxPublishers.

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
UGC AUTONOMOUS

M. Tech.: CAD/CAM	L	P	C
I Year –I Semester	3	-	3

(GM11G) COMPUTER AIDED PROCESS PLANNING

(Program Elective – II)

UNIT-I:

Introduction: The Place of Process Planning in the Manufacturing cycle-Process planning and production planning

Process planning and Concurrent Engineering, CAPP, Group Technology

UNIT-II:

Part Design Representation: Design Drafting-Dimensioning-Conventional Tolerance- Geometric Tolerance-CAD-input/output devices-Topology.

Geometric transformation- Perspective transformation-Data Structure-Geometric modeling for process planning--GT Coding-The OPITZ system-The MICLASS System.

UNIT-III;

Process Engineering and Process Planning: Experience based planning-Decision table and Decision trees-Process capability analysis.

Process planning-Variant process planning- Generative approach-Forward and backward planning, Input format, AI.

UNIT-IV

Computer Aided Process Planning Systems: Logical Design of process planning- Implementation considerations-Manufacturing system components.

Production Volume, Number of production families - CAM-I, CAPP, MIPLAN, APPAS, AUTOPLAN and PRO, CPPP.

UNIT-V

An Intergarted Process Planning Systems: Totally integrated process planning systems-An Overview.

Modulus structure-Data Structure-Operation-Report Generation, Expert process planning.

REFERENCE BOOKS:

1. Gideon Halevi and Roland D. Weill, "Principle of process planning - A Logical Approach", Chapman &Hall,1995
2. Chang T. C. & Richard A. Wysk, "An Introduction to automated process planning systems",PrenticeHall1985
3. Chang, T. C., "An Expert Process Planning System", Prentice Hall, 1985
4. Nanua Singh, "Systems Approach to Computer Intergrated Design and Manufacturing", JohnWiley&Sons,1996
5. Rao P.N., "Computer Aided Manufacturing", Tata McGraw Hill PublishingCo.,2000

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
UGC AUTONOMOUS

M. Tech.: CAD/CAM	L	P	C
I Year –I Semester	3	-	3

(GM11H) ADVANCED FINITE ELEMENT METHODS

(Core Course - III)

UNIT-I:

Introduction to FEM, basic concepts, historical back ground, applications of FEM, general description, comparison of FEM with other methods, variational approach, Glerkin's Methods. Co-ordinates, basic element shapes, interpolation function, Virtual energy principle, Rayleigh – Ritz method.

Properties of stiffness matrix, treatment of boundary conditions, solution of system of equations, shape functions and characteristics, Basic equations of elasticity, strain- displacementrelations.

UNIT-II:

1-D Structural Problems: Axial bar element – stiffness matrix, load vector, temperature effects, Quadratic shape functions and problems.

Analysis of Trusses: Plane Trusses and Space Truss elements and problems.

Analysis of BECAD/CAM: Hermite shape functions- stiffness matrix - Load vector- Problems

UNIT-III:

2-D problems: CST, LST, force terms, Stiffness matrix and load vectors, boundary conditions, Iso-parametric elements – quadrilateral element, shape functions – Numerical Integration.

Finite element modeling of Axi-symmetric solids subjected to Axi-symmetric loading with triangular elements. **Problems**: Tetrahedran element – Jacobian matrix – Stiffness matrix.

UNIT-VI:

Scalar Field Problems: 1-D Heat conduction-Slabs – fins.

2-D heat conduction problems – Introduction to Torsional problems

UNIT-V:

Dynamic considerations, Dynamic equations – consistent mass matrix

Eigen Values, Eigen vector, natural frequencies – mode shapes – modal analysis.

TEXT BOOKS:

1. Finite Element Methods: Basic Concepts and applications, Alavala, PHI.
2. Finite Element Method – Zincowitz / McGrawHill

REFERENCES:

1. The Finite Element Methods in Engineering / SS Rao/Pergamon.
2. Introduction to Finite Elements in Engineering, Chandrupatla, Ashok and Belegundu, Prentice–Hall
3. Introduction to Fininte element analysis- S. Md. Jalaludeen, Anuradha Publications,2012
4. AFirstCourseintheFiniteElementMethod/DarylLLogan/CengageLearning/5thEdition
5. Finite Element Method – Krishna Murthy/TMH
6. Finite Element Analysis – Bathe/PHI

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
UGC AUTONOMOUS

M. Tech.: CAD/CAM	L	P	C
I Year –I Semester	-	3	2

(GM11I) ADVANCED CAD LAB

I. Modelling

Modelling of Machine components using high end modeling software

II. Finite ElementAnalysis

(a) **Structural Analysis:** Determination of deflection and stresses in 2D & 3D trusses and beams. Determination deflection component principal and Von- mises stresses in plane stresses in plane stress, plane strain and Axi-symmetric component. Determination of stresses in 3D and shellstructures

(b) **Dynamic Analysis:** Estimation of natural frequencies and mode shapes, Harmonic responses of 2D beams.

Thermal Analysis: Study state heat transfer analysis of plane and axi- symmetric components.

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
UGC AUTONOMOUS

M. Tech.: CAD/CAM	L	P	C
I Year –I Semester	-	3	2

(GM11J) ADVANCED CAM LAB

Features and selection of CNC turning and milling centers. Practice in part programming and operation of CNC turning machines, subroutine techniques and use of cycles. Practice in part programming and operating a machining center, tool planning and selection of sequences of operations, tool setting on machine. Simulation of manufacturing system using CAM software. Practice in Robot programming and its languages. Robotic simulation using software

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
UGC AUTONOMOUS

M. Tech.: CAD/CAM	L	P	C
I Year –I Semester	2	-	2

(GM11K) RESEARCH METHODOLOGY AND IPR

(Core)

UNIT I

Meaning of research problem, Sources of research problem, Criteria characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem

Approaches of investigation of solutions for research problem, data collections, analysis, interpretation, necessary instrumentation

UNIT II

Effective literature studies approaches, Analysis, Plagiarism, Research ethics

UNITIII

Effective technical writing, How to write report, Paper developing by research proposal, Format of research proposal

A presentation and assessment by a review committee

UNIT IV

Nature of intellectual property: Patent, designs trade and copy right. Process of patenting and Development: Technological research, innovation, patenting, development.

International scenario: International cooperation on intellectual property. Procedure for grants of patents, patenting under PCT

UNIT V

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology.

Patent information and data bases, Geographical indications

UNIT VI

New Developments in IPR: Administration of patent system. IPR of Biological systems, Computer software etc.

Traditional knowledge case studies, IPR and IITs

REFERENCES:

1. Stuart Melville and Wayne Goddard, Research Methodology: An introduction for science and engineeringstudents
2. Wayne Goddard and Stuart Melville, Research methodologyand introduction
3. Ranjit Kumar 2nd Edition ,Research methodology: a step by step Guidefor beginners
4. Halbert, Resisting intellectual property, Taylor and Francis Ltd, 2007.
5. Mayall, Industrial design, McGrawHill,1992.
6. Niebel, Product desig, McGrawHill,1974.
7. Asimov, Introduction to Design PrenticeHall,1962.
8. Robert P.Merges, Peter S. Menell, MarkA. Lemly, ―intellectual property in new technological Age, 2016
9. T. Ramappa, ―Intellectual property rights under WTO, S.Chand, 2008

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
UGC AUTONOMOUS

M. Tech.: CAD/CAM	L	P	C
I Year –I Semester	2	-	-

(GM11L) DISASTER MANAGEMENT

(Audit Course- I)

UNIT-I: Introduction

Disaster: Definition, Factors and Significance; Difference between Hazard and Disaster; **Natural and Manmade Disasters:** Difference, Nature, Types and Magnitude.

UNIT-II:

Repercussions of Disasters and Hazards: Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches.

Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills,

Outbreaks of Disease and Epidemics, War and Conflicts

UNIT-III:

Disaster Prone Areas in India: Study of Seismic Zones; Areas Prone To Floods and Droughts, Landslides and Avalanches.

Areas Prone To Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases and Epidemics

UNIT-IV:

Disaster Preparedness and Management: Preparedness: Monitoring of Phenomena Triggering A Disaster Or Hazard;

Evaluation of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT-V: Risk Assessment: Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co- Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival

UNIT-VI: Disaster Mitigation: Meaning, Concept And Strategies of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation.

Non-Structural Mitigation, Programs Of Disaster Mitigation in India

SUGGESTED READINGS:

1. R. Nishith, Singh AK,―Disaster Management in India: Perspectives, Issues and strategies ―'New Royal book Company.
2. Sahni, Pardeep Et.Al. (Eds.), Disaster Mitigation Experiences and Reflection, Prentice Hall Of India, NewDelhi.
3. Goel S. L, Disaster Administration And Management Text And Case Studies‖, Deep & Deep Publication Pvt. Ltd., New Delhi.

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
UGC AUTONOMOUS

M. Tech.: CAD/CAM	L	P	C
I Year –II Semester	3	-	3

MANUFACTURING SYSTEMS: SIMULATION MODELLING AND ANALYSIS
(GM12A) (Core Course III)

UNIT - I:

System – ways to analyze the system – Model - types of models – Simulation – Definition – Types of simulation models – steps involved in simulation – Advantages & Disadvantages.

Parameter estimation – estimator – properties – estimate – point estimate – confidence interval estimates – independent – dependent – hypothesis – types of hypothesis- steps – types 1& 2 errors – Framing – strong law oflarge numbers.

UNIT - II:

Building of Simulation model – validation – verification – credibility – their timing – principles of valid simulation Modeling – Techniques for verification – statistical procedures for developing credible model.

Modeling of stochastic input elements – importance – various procedures – theoretical distribution – continuous – discrete – their suitability in modeling.

UNIT - III:

Generation of random variates – factors for selection – methods – inverse transform – composition – convolution – acceptance – rejection – generation of random variables – exponential – uniform – weibull –

normal Bernoullie – Binomial – uniform – poisson.

Simulation languages – comparison of simulation languages with general purpose languages
– Simulation languages vs Simulators – software features – statistical capabilities – G P S S – SIMAN- SIMSCRIPT –Simulation of M/M/1 queue – comparison of simulation languages.

UNIT - IV:

Output data analysis – Types of Simulation w.r.t output data analysis – warm-up period- Welch algorithm

Approaches for Steady State Analysis – replication – Batch means methods – comparisons

UNIT –V:

Applications of Simulation – flow shop system – job shop system – M/M/1 queues with infinite and finite capacities.

Simple fixed period inventory system – Newboy paper problem.

TEXT BOOKS:

1. Simulation Modelling and Analysis by Law, A.M. & Kelton, McGraw Hill, 2nd Edition, NewYork, 1991.
2. Discrete Event System Simulation by Banks J. & Carson J.S., PH, Englewood Cliffs, NJ, 1984.
3. Simulation of Manufacturing Systems by Carrie A., Wiley, NY, 1990
4. A Course in Simulation by Ross, S.M., McMillan,NY,1990.
5. Simulation Modelling and SIMNET by Taha H.A., PH, Englewood Cliffs,NJ,1987

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
UGC AUTONOMOUS

M. Tech.: CAD/CAM	L	P	C
I Year –II Semester	3	-	3

(GM12B) PRECISION ENGINEERING
(Core Course IV)

UNIT - I:

Concepts of Accuracy: Introduction – Concept of Accuracy of Machine Tools – Spindle and Displacement Accuracies – Accuracy of numerical Control Systems – Errors due to Numerical Interpolation Displacement Measurement System and Velocity Lags.

Geometric Dimensioning and Tolerancing: Tolerance Zone Conversions – Surfaces, Features, Features of Size, Datum Features – Datum Oddly Configured and Curved Surfaces as Datum Features, Equalizing Datums –Datum Feature of Representation – Form Controls, Orientation Controls – Logical Approach to Tolerancing.

UNIT - II:

Datum Systems: Design of freedom, Grouped Datum Systems – different types, two and three mutually perpendicular grouped datum planes; Grouped datum system with spigot and recess, pin and hole.

Grouped Datum system with spigot and recess pair and tongue – slot pair – Computation of Transnational and rotational accuracy, Geometric analysisand application.

UNIT - III:

Tolerance Analysis: Process Capability ,Mean, Variance, Skewness, Kurtosis, Process Capability Metrics, C_p, C_{pk}, Cost aspects, Feature Tolerances, Geometric Tolerances.

Tolerance Charting Techniques: Operation Sequence for typical shaft type of components, Preparation of Process drawings for different operations, Tolerance worksheets and centrally analysis, Examples. Design features to facilitate machining; Datum Features – functional and manufacturing. Components design – Machining considerations, Redesign for manufactured, Examples

UNIT – IV:

Surface finish, Review of relationship between attainable tolerance grades and different machining process.

Cumulative effect of tolerances sure fit law, normal law and truncated normal law

UNIT - V:

Fundamentals of Nanotechnology: System of nanometer accuracies – Mechanism of metal Processing – Nano physical processing of atomic bit units. Nanotechnology and Electrochemical atomic bit processing.

Measuring systems processing: In processing or in-situ measurement of position of processing point-Post process and on-machine measurement of dimensional features and surface-mechanical and optical measuring systems.

TEXT BOOKS:

1. Precision Engineering in Manufacturing / murthy R. L., / New Age International (P) limited,1996.
2. Geometric Dimensioning and Tolerancing / James D.Meadows / Marcel Dekker Inc.1995.

REFERENCE BOOKS:

1. Nano Technology / Norio Taniguchi / Oxford University Press, 1996
2. Engineering Design – Asystematic Approach /Matousek / Blackie & Son Ltd, London.

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
UGC AUTONOMOUS

M. Tech.: CAD/CAM	L	P	C
I Year –II Semester	3	-	3

(GM12C) INTELLIGENT MANUFACTURING SYSTEMS

(Program Elective III)

UNIT - I:

Computer Integrated Manufacturing Systems Structure and functional areas of CIM system, - CAD, CAPP, CAM**,** CAQC, ASRS. Advantages of CIM

Manufacturing Communication Systems - MAP/TOP, OSI Model, Data Redundancy, Top- down and Bottom-up Approach, Volume of Information. Intelligent Manufacturing System Components, System Architecture and Data Flow, System Operation.

UNIT II:

Components of Knowledge Based Systems - Basic Components of Knowledge Based Systems, Knowledge Representation.

Comparison of Knowledge Representation Schemes, Interference Engine, Knowledge Acquisition.

UNIT III:

Machine Learning - Concept of Artificial Intelligence, Conceptual Learning, Artificial Neural Networks - Biological Neuron, Artificial Neuron.

Types of Neural Networks, Applications in Manufacturing.

UNIT IV:

Automated Process Planning - Variant Approach, Generative Approach, Expert Systems for Process Planning, Feature Recognition, Phases of Process planning. Knowledge Based System for Equipment Selection (KBSES) - Manufacturing system design.

Equipment Selection Problem, Modeling the Manufacturing Equipment Selection Problem, Problem Solving approach in KBSES, Structure ofthe KRSES.

UNIT V:

Group Technology: Models and Algorithms Visual Method, Coding Method, Cluster Analysis Method, Matrix Formation - Similarity Coefficient Method, Sorting-based Algorithms, Bond Energy Algorithm, Cost Based method, Cluster Identification Method, Extended CI Method.

Knowledge Based Group Technology - Group Technology in Automated Manufacturing System. Structure of Knowledge based system for group technology (KBSCIT) — Data Base, Knowledge Base, Clustering Algorithm.

REFERENCES:

1. Intelligent Manufacturing Systems/ Andrew Kusiak /Prentice Hall.
2. Artificial Neural Networks/Yagna Narayana/PHI/2006
3. Automation, Production Systems and CIM / Groover M.P./PHI/2007
4. Neural networks: A comprehensive foundation/ Simon Hhaykin/PHI.
5. Artificial neural networks/B. Vegnanarayana/PHI
6. Neural networks in Computer intelligence/ Li Min Fu/TMH/2003
7. Neural networks/ James A Freeman David M S kapura /Pearson education /2004
8. Introduction to Artificial Neural Systems/Jacek M. Zurada/JAICO Publishing House Ed. 2006.

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
UGC AUTONOMOUS

M. Tech.: CAD/CAM	L	P	C
I Year –II Semester	3	-	3

(GM12D) SPECIAL MANUFACTURING PROCESS

(Program Elective III)

UNIT - I:

Surface Treatment: Scope, Cleaners, Methods of cleaning, Surface coating types, and ceramic and organic methods of coating, economics of coating.

Electro forming, Chemical vapor deposition, thermal spraying, Ion implantation, diffusion coating, Diamond coating and cladding

UNIT- II

Processing of Ceramics: Applications, characteristics, classification. Processing of particulate ceramics, Powder preparations, consolidation, Drying, sintering, Hot compaction, Area of application, finishing of ceramics.

Processing of Composites: Composite Layers, Particulate and fiber reinforced composites, Elastomers, Reinforced plastics, MMC, CMC, Polymer matrix composites.

UNIT- III

Fabrication of Microelectronic Devices: Crystal growth and wafer preparation, Film Deposition oxidation, lithography, bonding and packaging, reliability and yield.

Printed Circuit boards, computer aided design in micro electronics, surface mount technology, Integrated circuit economics.

UNIT - IV

E-Manufacturing: Nano manufacturing techniques and micromachining.

High Speed Machining and hot machining

UNIT -V

Rapid Prototyping: Working Principles, Methods, Stereo Lithography, Laser Sintering, Fused Deposition Method, Applications and Limitations. Rapid tooling, Techniques of rapid manufacturing.

REFERENCES:

1. Manufacturing Engineering and Technology *I* Kalpakijian / Adisson Wesley, 1995.
2. Process and Materials of Manufacturing / R. A. Lindburg/ 1th edition, PHI 1990.
3. Microelectronic packaging handbook / Rao. R. Thummala and Eugene, J.R ymaszewski / Van Nostr and Renihold,
4. MEMS & Micro Systems Design and manufacture / Tai — Run Hsu/TMGH
5. Advanced Machining Processes / V.K.Jain /Allied Publications.
6. Introduction to Manufacturing Processes / John A Schey Mc Graw Hill

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
UGC AUTONOMOUS

M. Tech.: CAD/CAM	L	P	C
I Year –II Semester	3	-	3

(GM12E) OPTIMIZATION TECHNIQUES ANDAPPLICATIONS
(Program Elective III)

UNIT - I:

Single Variable Non-Linear Unconstrained Optimization: Elimination methods: Uni- Model function-its importance, Fibonacci method & Golden section method.

Interpolation methods: Quadratic & Cubic interpolation methods.

UNIT- II:

Multi variable non-linear unconstrained optimization: Direct search methods – Univariant method, Pattern search methods – Powell's, Hook -Jeeves, Rosen brock search methods.

Gradient methods: Gradient of function& its importance, Steepest descent method, Conjugate direction methods: Fletcher-Reeves method & variable metric method.

UNIT- III:

Linear Programming: Formulation, Simplex method & Artificial variable optimization techniques: Big M & Two phase methods.

Sensitivity analysis: Changes in the objective coefficients, constants& coefficients of the constraints. Addition of variables, constraints. Simulation – Introduction – Types- steps – applications: inventory & queuing – Advantages and disadvantages

UNIT- IV:

Integer Programming: Introduction – formulation – Geometry cutting plane algorithm – Zero or one algorithm, branch and bound method

Stochastic Programming: Basic concepts of probability theory, random variables- distributions-mean, variance, correlation, co variance, joint probability distribution. Stochastic linear programming: Chanceconstrained algorithm.

UNIT- V:

Geometric Programming: Polynomials – Arithmetic - Geometric inequality – unconstrained G.P- constrained G.P (≤type only)

Non Traditional Optimization Algorithms: Genetics Algorithm-Working Principles,Similarities and Differences between Genetic Algorithm & Traditional Methods. Simulated Annealing-Working Principle-Simple Problems. Introduction to Particle Swarm Optimization (PSO) (very brief)

TEXT BOOKS:

1. Optimization theory & Applications by S.S.Rao, NewAge International.
2. Optimization for Engineering Design by Kalyanmoy Deb, PHI

REFERENCE BOOKS:

1. Operations Research by S.D. Sharma
2. Operation Research by H.A.Taha,TMH
3. Optimization in operations research by R.LRardin
4. Optimization Techniques by Benugundu &Chandraputla,PearsonAsia. Optimization Techniques theory and practice by M.C.Joshi, K.M.Moudgalya, Narosa Publications

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
UGC AUTONOMOUS

M. Tech.: CAD/CAM	L	P	C
I Year –II Semester	3	-	3

(GM12F) ADVANCED MECHATRONICS
(Program Elective IV)

UNIT - I:

Mechatronics systems, elements, levels of mechatronics system, Mechatronics design process, system, measurement systems, control systems, microprocessor-based controllers, advantages and disadvantages of mechatronics systems.

Sensors and transducers, types, displacement, position, proximity, velocity, motion, force, acceleration, torque, fluid pressure, liquid flow, liquid level, temperature andlight sensors.

UNIT-II

Solid state electronic devices, PN junction diode, BJT, FET, DIA and TRIAC. Analog signal conditioning, amplifiers, filtering.

Introduction to MEMS & typical applications

UNIT-III

Hydraulic and pneumatic actuating systems, Fluid systems, Hydraulic and pneumatic systems, components, control valves, electro-pneumatic, hydro-pneumatic.

Electro-hydraulic servo systems: Mechanical actuating systems and electricalactuating systems.

UNIT-IV

Digital electronics and systems, digital logic control, micro processors and micro controllers, programming, process controllers.

Programmable logic controllers, PLCs versus computers, application of PLCs for control.

UNIT-V

System and interfacing and data acquisition, DAQS, SCADA, A to D and D to A conversions; Dynamic models and analogies, System response.

Design of mechatronics systems &future trends.

REFERENCES:

1. MECHATRONICS Integrated Mechanical Electronics Systems/KP Ramachandran & GK Vijaya Raghavan /WILEY India Edition/2008
2. MechatronicsElectronicsControlSystemsinMechanicalandElectrical Engineering by W Bolton, Pearson Education Press, 3rdedition,2005.
3. Mechatronics Source Book by Newton C Braga, Thomson Publication , Chennai.
4. Mechatronics – N. Shanmugam / AnuradhaAgencies Publishers.
5. Mechatronics System Design /Devdasshetty/Richard/Thomson.
6. Mechatronics/M.D. Singh/J.G. Joshi/PHI.
7. Mechatronics – Electronic Control Systems in Mechanical and Electrical Engg. 4th Edition, Pearson, 2012W.Bolton
8. Mechatronics – Principles and Application Godfrey C. Onwubolu, Elsevier, 2006 Indian print

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
UGC AUTONOMOUS

M. Tech.: CAD/CAM	L	P	C
I Year –II Semester	3	-	3

DESIGN AND MANUFACTURING OF MEMS AND MICRO SYSTEMS
(GM12G) (Program Elective IV)

UNIT - I:

Overview and Working Principles of MEMS and Microsystems: MEMS & Micro systems, Evolution of Micro fabrication, Microsystems & Microelectronics, Microsystems & Miniaturization.

Applications of MEMS in Industries, Micro sensors, Micro actuation, MEMS with Micro actuators Micro accelerometers,Micro fluidics

UNIT II:

Engineering Science for Microsystems Design and Fabrication: Atomic structure of Matter, Ions and Ionization

Molecular Theory of Mater and Intermolecular Force, Doping of Semiconductors, The diffusion Process, Plasma Physics, Electrochemistry, Quantum Physics

UNIT III:

Engineering Mechanics for Microsystems Design: Static Bending of thin Plates, Mechanical Vibration

Thermo mechanics Fracture Mechanics, Thin-Film Mechanics, Overview of Finite Element Stress Analysis

UNIT IV:

Thermo Fluid Engineering & Microsystems Design: Overview of Basics of Fluid Mechanics in Macro and Meso scales, Basic equations in Continuum Fluid dynamics, Laminar Fluid Flow in Circular Conduits, Computational Fluid Dynamics, Incompressible Fluid Flow in Micro conduits, Fluid Flow in Sub micrometer and Nano scale.

Overview of Heat conduction in Solids, Heat Conduction in Multilayered Thin films and in solids in sub micrometer scale, Design Considerations, Process Design Mechanical Design, Mechanical Design using FEM, Design of a Silicon Die for a Micro pressureSensor.

UNIT V:

Materials for MEMS & Microsystems and Their Fabrication: Substrates and Wafers, Active substrate materials, Silicon as a substrate material, Silicon Compounds, Silicon Piezo-resistors, Gallium Arsenide, Quartz, Piezoelectric Crystals and Polymers, Photolithography.

Ion implantation, Diffusion and oxidation, chemical and physical vapor deposition, Etching, Bulk micro manufacturing, Surface Micromachining, The LIGA Process

REFERENCES:

1. MEMs & Microsystems: Design & Manufacture/ Tai-Ran Hsu/Tata Mc-Graw Hill., ed./2002
2. An Introduction to Microelectromechanical Systems Engineering/ Maluf, M./ArtechHouse, Boston,2000
3. Micro robots and Micromechanical Systems/ Trimmer, W.S.N/ Sensors & Actuators, vol 19, no.1989.
4. Applied Partial Differential Equations/ Trim, D.W/ PWS-Kent Publishing /Boston1990.

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
UGC AUTONOMOUS

M. Tech.: CAD/CAM	L	P	C
I Year –II Semester	3	-	3

(GM12H) DESIGN FOR MANUFACTURING AND ASSEMBLY
(Program Elective- IV)

UNIT - I:

Introduction: Design philosophy steps in Design process - General Design rules for manufacturability - basic principles of designing for economical production - creativity in design.

Materials: Selection of Materials for design Developments in Material technology - criteria for material selection - Material selection interrelationship with process selection process selection charts.

UNIT- II

Machining Process: Overview of various machining processes - general design rules for machining - Dimensional tolerance and surface roughness - Design for machining - Ease - Redesigning of components for machining ease with suitable examples. General design recommendations for machined parts

Metal Casting: Appraisal of various casting processes, selection of casting process, - general design considerations for casting - casting tolerances - use of solidification simulation in casting design - product design rules for sand casting.

UNIT- III

Metal Joining: Appraisal of various welding processes, Factors in design of weldments - general design guidelines - pre and post treatment of

welds - effects of thermal stresses in weld joints - design of brazed joints. Forging - Design factors for forging - Closed dies forging design - parting lines of die drop forging die design - general design recommendations.

Extrusion & Sheet Metal Work: Design guidelines for extruded sections - design principles for Punching, Blanking, Bending, and Deep Drawing - Keeler Goodman Forming Line Diagram - Component Design for Blanking.

UNIT-IV

Assemble Advantages: Development of the assemble process, choice of assemble method; assemble advantages social effects of automation.

Automatic Assembly Transfer Systems: Continuous transfer, intermittent transfer, indexing mechanisms, and operator - paced free – transfer machine.

UNIT-V

Design of Manual Assembly: Design for assembly fits in the design process, general design guidelines for manual assembly, development of the systematic DFA methodology, assembly efficiency, and classification system for manual handling.

Classification system for manual insertion and fastening, effect of part symmetry on handling time, effect of part thickness and size on handling time, effect of weight on handling time, parts requiring two hands for manipulation, effects of combinations of factors, effect of symmetry effect of chamfer design on insertion operations, estimation of insertion time.

REFERENCES:

1. Assembly Automation and Product Design/ Geoffrey Boothroyd/ Marcel Dekker Inc., NY,1992.
2. Engineering Design - Material & Processing Approach/ George E. Deiter/McGraw Hill Intl. 2nd Ed.2000.
3. Hand Book of Product Design/ Geoffrey Boothroyd/ Marcel and Dekken,N.Y.1990.
4. Product Design for Manufacturing and Assembly/ GeoffreyBoothroyd, Peter Dewhurst & Winston Ansthony Knight/CRC Press/2010

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
UGC AUTONOMOUS

M. Tech.: CAD/CAM	L	P	C
I Year –II Semester	-	3	1.5

(GM12I) SIMULATION OF MANUFACTURING SYSTEMS LAB

The students will be given training on the use and application on manufacturing simulation software:

1. AGV planning
2. ASRS simulation and performanceevaluation
3. Machines, AGVs and AS/RSintegrated problems
4. JIT system
5. Kanban flow
6. Materialhandling systems
7. M.R.P. Problems
8. Shop floorscheduling etc.

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
UGC AUTONOMOUS

M. Tech.: CAD/CAM	L	P	C
I Year –II Semester	-	3	1.5

(GM12J) PRECISION ENGINEERING LAB

1. Hydraliccircuit
2. Pneumaticcircuit
3. Closed loop controlsystems
4. Study of the chip formation in turningprocess
5. Study of operation of tool and cuttergrinder
6. Study of operation of Centre-lessgrinder
7. Determination of cutting forcesin turning
8. Inspection of parts using Toolmaker's microscope,
9. Measurement of surface roughness usingTalysurf
10. Study of micro-controllers, programming on various CNC machinetools

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
UGC AUTONOMOUS

M. Tech.: CAD/CAM	L	P	C
I Year –II Semester	-	4	2

(GM12K) MINI PROJECT

Course Outcomes: At the end of the course, the student will be able to:

1. Identify structural engineering problems reviewingavailable literature.
2. Study different techniques used to analyze complexstructural systems.
3. Work on the solutions given and present solution by using his/her technique applying engineering principles.

Syllabus Contents:

Mini Project will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latestliterature available.

End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions highlighting individuals'contribution.

Continuous assessment of Mini Project at Mid Sem and End Sem will be monitored by the departmental committee.

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
UGC AUTONOMOUS

M. Tech.: CAD/CAM	L	P	C
II Year –I Semester	3	-	3

PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

(GM12L) (Audit Course-II)

UNIT-I: Neetisatakam -Holistic development of personality

- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride&heroism)
- Verses- 26,28,63,65 (virtue)
- Verses- 52,53,59 (dont's)
- Verses- 71,73,75,78(do's)

UNIT-II: Approach to day to day work andduties.

- ShrimadBhagwadGeeta : Chapter 2-Verses41,47,48,
- Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5, 13, 17,23,35,
- Chapter 18-Verses 45,46,48

UNIT-III: Statements of basic knowledge.

- ShrimadBhagwadGeeta: Chapter2-Verses 56,62,68
- Chapter 12 -Verses 13, 14, 15,16,17,18
- Personality of Role model. ShrimadBhagwadGeeta:
- Chapter2-Verses 17, Chapter3-Verses36,37,42,
- Chapter 4-Verses18,38,39
- Chapter18 –Verses37,38,63

SUGGESTED READING

1. Srimad Bhagavad Gita by Swami SwarupanandaAdvaita Ashram (Publication Department), Kolkata
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam,NewDelhi.

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
UGC AUTONOMOUS

M. Tech.: CAD/CAM	L	P	C
II Year –I Semester	3	-	3

(GM13A) MECHANICS OF COMPOSITE MATERIALS

(Program Elective- V)

UNIT-I

Introduction: Fibres, Matrix materials, interfaces, polymer matrix composites.

Metal matrix composites, ceramic matrix composites carbon fibre composites.

UNIT-II

Micromechanics of Composites: Mechanical properties-Prediction of Elastic constant, micromechanical approach, Halpin-Tsai equations, Transverse stresses.

Thermal properties- Hygro thermal stresses, mechanics of load transfer from matrix to fibre.

UNIT-III

Macro mechanics of Composites: Elastic constants of a lamina, relations between engineering constants and reduced stiffness and compliances, variation of lamina properties with orientation, analysis of laminated composites, stresses and strains with orientation, inter- laminar stresses and edge effects.

Simplified composite beam solutions, bending of laminated beams

UNIT-IV

Strength, fracture, fatigue and design: Tensile and compressive strength of unidirectional fibre composites,

Fracture modes in composites: Single and multiple fracture, de-bonding, fibre pullout and de-lamination failure, fatigue of laminate composites. Effect of variability of fibre strength. **Strength of an orthotropic lamina:** Max stress theory, max strain criteria, maximum work (Tsai-Hill) criterion, quadratic interaction criteria. Designing with composite materials.

UNIT-V

Analysis of plates and stress: Plate equilibrium equations, Bending of composite plates, Levy and Navier solution for plates of composite materials.

Analysis of composite cylindrical shells under axially symmetric loads

REFERENCES:

1. Jones, R.M., Mechanics of Composite Materials, Mc Graw Hill Co., 1967.
2. Calcote, L.R., The Analysis of Laminated Composite Structures, VanNostrand, 1969.
3. Whitney, I.M. Daniel, R.B. Pipes, Experimental Mechanics of Fibre Reinforced Composite Materials, Prentice Hall,1984.
4. Hyer, M.W., Stress Analysis of Fibre Reinforced Composite Materials, Mc Graw Hill Co., 1998.
5. Carl. T. Herakovich, Mechanics of Fibrous Composites, John Wiley SonsInc.,1998**.**

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
UGC AUTONOMOUS

M. Tech.: CAD/CAM	L	P	C
I Year –II Semester	3	-	3

(GM13B) ADVANCED INDUSTRIAL ROBOTICS

(Program Elective- V)

UNIT-I

Introduction: Automation and Robotics, Robot anatomy, robot configuration, motions joint notation work volume, robot drive system, control system and dynamic performance, precision of movement.

Control System and Components: basic concept and modals controllers control system analysis, robot activation and feedback components. Positions sensors, velocity sensors, actuators sensors, power transmission system.

UNIT - II

Motion Analysis and Control: Manipulator kinematics, position representation forward transformation, homogeneous transformation.

Manipulator path control, robot dynamics, configuration of robot controller

UNIT - III

End Effectors: Grippers-types, operation, mechanism, force analysis, tools as end effectors consideration in gripper selection and design. SENSORS: Desirable features, tactile, proximity and range sensors, uses sensors in robotics.

Machine Vision: Functions, Sensing and Digitizing-imaging, Devices,

Lighting techniques, Analog to digital single conversion, image storage, Image processing and Analysis-image data reduction, Segmentation feature extraction. Object recognition, training the vision system, Robotics application.

UNIT - IV

Robot Programming: Lead through programming, Robot programming as a path in space, Motion interpolation, WAIT, SINONAL AND DELAY commands, Branching capabilities and Limitations.

Robot Languages: Textual robot Languages, Generation, Robot language structures, Elements in function

UNIT - V

Robot Cell DESGIN AND CONTROL: Robot cell layouts-Robot centered cell, In-line robot cell, Considerations in work design, Work and control, Inter locks, Error detect ion, Work wheel controller.

Robot Application: Material transfer, Machine loading/unloading. Processing operation, Assembly and Inspection, Feature Application

REFERENCES:

1. Industrial Robotics / Groover M P/PearsonEdu.
2. Introduction to Robotic Mechanics and Control by JJ Craig, Pearson,3rdedition.
3. Robotics / Fu K S/McGrawHill.
4. Robotic Engineering / Richard D. Klafter,Prentice Hall
5. Robot Analysis and Intelligence / Asada and Slotine /Wiley Inter-Science.
6. Robot Dynamics & Control – Mark W. Spong and M. Vidyasagar / John Wiley & Sons (ASIA)PteLtd.
7. Robotics and Control / Mittal R K &Nagrath I J/TMH

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
UGC AUTONOMOUS

M. Tech.: CAD/CAM	L	P	C
II Year – I Semester	3	-	3

(GM13C) PRODUCTION AND OPERATIONS MANAGEMENT
(Program Elective - V)

UNIT-I

Operation Management: Definition – Objectives – Types of production systems – historical development of operations management – Current issues in operation management.

Product design – Requirements of good product design – product development – approaches – concepts in product development – standardization – simplification – Speed to market – Introduction to concurrent engineering.

UNIT – II

Value Engineering: objective – types of values – function & cost – product life cycle- steps in value engineering – methodology in value engineers – FAST Diagram – Matrix Method.

Location – Facility location and layout – Factors considerations in Plant location- Comparative Study of rural and urban sites – Methods of selection plant layout – objective of good layout – Principles – Types of layout – linebalancing.

UNIT - III

Aggregate Planning: definition – Different Strategies – Various models of Aggregate Planning – Transportation and graphical models. Advance

inventory control systems push systems – Material Requirement – Terminology – types of demands – inputs to MRP- techniques of MRP – Lot sizing methods – benefits and drawbacks of MRP.

Manufacturing Resources Planning (MRP –II), Pull systems – vs Push system – Just in time (JIT) philosophy Kanban System – Calculation of number of Kanbans Requirements for implementation JIT – JIT Production process – benefitsof JIT.

UNIT - IV

Scheduling: Policies – Types of scheduling – Forward and Backward Scheduling – Gantt Charts

Flow shop Scheduling – n jobs and 2 machines, n jobs and 3 machines – job shop Scheduling – 2 jobs and n machines – Line of Balance.

UNIT – V

Project Management: Programming Evaluation Review Techniques (PERT) – three times estimation – critical path

Probability of completion of project – critical path method – crashing of simple nature

REFERENCES:

1. Operations Management/ E.S. Buffs/ John Wiley & Sons/2007
2. Operations Management Theory and Problems/ Joseph G. Monks / Macmillan / McGraw Hill /3rdEdition.
3. Production Systems Management/ James I. Riggs / John Wiley&Sons.
4. Production and Operations Management/ Chary/ McGrawHill/2004
5. Operations Management/ Richard Chase/ Mc GrawHill/2006
6. Production and Operation Management/PannerSelvam/PHI.
7. Production and Operation Analysis/Nahima/McGrawHill/2004

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
UGC AUTONOMOUS

M. Tech.: CAD/CAM	L	P	C
II Year – I Semester	3	-	3

(GM1OA) NANO TECHNOLOGY
(Open Elective)

UNIT-I : Introduction: History and Scope, Can Small Things Make a Big Difference? Classification of Nano-structured Materials, Fascinating Nanostructures.

Applications of Nano-materials, Nature: The Best of Nanotechnologist, Challenges, and Future Prospects.

UNIT – II: Unique Properties of Nano-materials: Microstructure and Defects in Nano-crystalline Materials: Dislocations, Twins, stacking faults and voids, Grain Boundaries, triple, and disclinations, Effect of Nano-dimensions on Materials Behavior: Elastic properties, Melting Point, Diffusivity, Grain growth characteristics, enhanced solid solubility.

Magnetic Properties: Soft magnetic Nano-crystalline alloy, Permanent magnetic Nano-crystalline materials, Giant Magnetic Resonance, Electrical Properties, Optical Properties, Thermal Properties, andMechanical Properties.

UNIT – III: Synthesis Routes: Bottom up approaches: Physical Vapor Deposition, Inert Gas Condensation, Laser Ablation, Chemical Vapor Deposition, Molecular Beam Epitaxy, Solgel method, Self assembly, Top down approaches: Mechanical alloying, Nano- lithography.

Consolidation of Nano-powders: Shock wave consolidation, Hotiso-static pressing and Cold iso-static pressing Spark plasma sintering.

UNIT – IV: Tools to Characterize Nano-materials: X-Ray Diffraction (XRD), Small Angle X-ray scattering (SAXS), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM).

Atomic Force Microscopy (AFM), Scanning Tunneling Microscope (STM), Field Ion Microscope (FEM), Three-dimensional Atom Probe (3DAP), Nano-indentation

UNIT – V: Applications of Nano-materials: Nano-electronics, Micro- and Nano- electro mechanical systems (MEMS/NEMS), Nano-sensors, Nano-catalysts,

Food and Agricultural Industry, Cosmetic and Consumer Goods, Structure and Engineering, Automotive Industry, Water Treatment and the environment, Nano-medical applications, Textiles, Paints, Energy, Defence and Space Applications, Concerns and challenges of Nanotechnology

TEXTBOOKS:

1. Text Book of Nano Science and Nano Technology – B.S. Murthy, P.Shankar, Baldev Raj, B.B. Rath and James Munday,UniversityPress-IIM.
2. Introduction to Nanotechnology – Charles P. Poole, Jr., and Frank J. Owens, Wley India Edition, 2012.

REFERENCES BOOKS:

1. Nano: The Essentials by T. Pradeep, Mc Graw-HillEducation.
2. Nano materials, Nanotechnologies and Design by Michael F. Ashby, Paulo J. Ferreira and Daniel L. Schodek.
3. Transport in Nano structures- David Ferry, Cambridge Universitypress2000
4. Nanofabrication towards biomedical application: Techniques, tools, Application and impact – Ed. ChallaS.,S. R. Kumar, J. H.Carola.
5. Carbon Nanotubes: Properties and Applications- Michael J.O'Connell.
6. Electron Transport in Mesoscopic systems – S. Dutta, Cambridge Universitypress

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
UGC AUTONOMOUS

M. Tech.: CAD/CAM	L	P	C
II Year – I Semester	3	-	3

(GM1OB) INDUSTRIAL SAFETY

(Open Elective)

UNIT-I :

Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure.

Describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment andmethods

Unit-II:

Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department.

Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

Unit-III:

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down

grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication,

Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods

Unit-IV:

Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools.

Hydraulic, pneumatic, automotive, thermal and electrical equipment's like i. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

Unit-V:

Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance.

Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

REFERENCE:

1. Maintenance Engineering Handbook, Higgins & Morrow, DaInformation Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
UGC AUTONOMOUS

M. Tech.: CAD/CAM	L	P	C
II Year – I &II Semester	-	-	10+16

DISSERTATION PHASE – I AND PHASE – II

(GM13D AND GM14A)

Teaching Scheme Lab work: 20 and 32 hrs/week for phase I and II respectively

Objectives:

At the end of this course, students will be able to

- Ability to synthesize knowledge and skills previously gained and applied to an in-depth study and execution of new technical problem.
- Capable to select from different methodologies, methods and forms of analysis to produce a suitable research design, and justifytheir design.
- Ability to present the findings of their technical solution in awritten report.
- Presenting the work in International/ National conference or reputed journals.

Syllabus Contents:

The dissertation / project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The dissertation should have the following:

- Relevance to social needsof society
- Relevance to value addition to existing facilities inthe institute
- Relevance toindustry need
- Problems ofnational importance
- Research and development invarious domain

The student should complete the following:

Literature survey Problem Definition

- Motivation for studyand Objectives
- Preliminary design / feasibility /modular approaches
- Implementationand Verification
- Reportand presentation

The dissertation stage II is based on a report prepared by the students on dissertation allotted to them. It may be based on:

- Experimental verification / Proofof concept.
- Design, fabrication, testing ofCommunication System.
- The viva-voce examination will be based on the above reportand work.

Guidelines for Dissertation Phase – I and II

- As per the AICTE directives, the dissertation is a yearlong activity, to be carried out and evaluated in two phases i.e. Phase – I: July to December and Phase – II: Januaryto June.
- The dissertation may be carried out preferably in-house i.e. department's laboratories and centers OR in industry allotted through department's T &P coordinator.
- After multiple interactions with guide and based on comprehensive literature survey, the student shall identify the domain and define dissertation objectives. The referred literature should preferably include Springer/Science Direct. In case of Industry sponsored

projects, the relevant application notes, while papers, catalogues should be referred&reported.

- Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and phase wise work distribution, and submit the proposal within a month from the dateof registration.
- Phase – I deliverables: A document report comprising of summary of literature survey, detailed objectives, project specifications, paper and/or computer aided design, proof of concept/functionality, part results, a record of continuous progress.
- Phase – I evaluation: A committee comprising of guides of respective specialization shall assess the progress/performance of the student based on report, presentation and Q & A. In case of unsatisfactory performance, committee may recommend repeating thephase-I work.
- During phase – II, student is expected to exert on design, development and testing of the proposed work as per the schedule. Accomplished results/contributions/innovations should be published in terms of research papers in reputed journals and reviewed focused conferencesORIP/Patents.
- Phase – II deliverables: A dissertation report as per the specified format, developed system in the form of hardware and/or software, a record of continuous progress.
- Phase – II evaluation: Guide along with appointed external examiner shall assess the progress/performance of the student based on report, presentation and Q & A. In case of unsatisfactory performance, committee may recommend for extension or repeating the work.