Appendix - A

GONDWANA UNIVERSITY, GADCHIROLI

Two Years Post Graduate Degree Program in the Faculty of Engineering and Technology
Course and Examination Scheme with Credit Grade System

I - Semester M. Tech. (CAD/CAM)

Course Code	Course Title	Teaching Scheme				Examination Scheme									
		Hours per week			No. of Credits	Theory Course						Laboratory Course			
		L	T	P		Duration of Paper (Hrs.)	Max. Marks	Max. Marks		Total	Min. Passing Marks	Max. Marks	Max. Marks	Total	Min. Passing Marks
								Internal Assessment							
							ESE	MSE	IE			TW	POE		
901	Data Structures & Algorithms	3	1	-	4	3	70	10	20	100	50	-	-	-	-
902	CNC & Robotics	3	1	-	4	3	70	10	20	100	50	-	-	-	-
903	Product Design & Development	3	1	-	4	3	70	10	20	100	50	-	-	-	-
904	Computer Graphics for CAD/CAM	3	1	-	4	3	70	10	20	100	50	-	-	-	-
Laboratory															
905	CAM Lab	-	-	4	4	-	-	-	-	-	-	50	50	100	50
Total		12	04	04	20	400						100			
Semester Total		**20**			**20**	**500**									

Appendix - A

Two Years Post Graduate Degree Program in the Faculty of Engineering and Technology
Course and Examination Scheme with Credit Grade System

II - Semester M. Tech. (CAD/CAM)

Course Code	Course Title	Teaching Scheme				Examination Scheme									
		Hours per week			No. of Credits	Theory Course						Laboratory Course			
		L	T	P		Duration of Paper (Hrs.)	Max. Marks	Max. Marks		Total	Min. Passing Marks	Max. Marks	Max. Marks	Total	Min. Passing Marks
								Internal Assessment							
							ESE	MSE	IE			TW	POE		
1001	Computer Integrated Manufacturing System	3	1	-	4	3	70	10	20	100	50	-	-	-	-
1002	Product Data Management	3	1	-	4	3	70	10	20	100	50	-	-	-	-
1003	Finite Element Method	3	1	-	4	3	70	10	20	100	50	-	-	-	-
1004	Elective 1. Computer Aided Tool Design 2. Total Quality Systems & Engineering 3. Mechatronics 4. Modelling and Simulation	3	1	-	4	3	70	10	20	100	50	-	-	-	-
Laboratory															
1005	CAD Lab	-	-	4	4	-	-	-	-	-	-	50	50	100	50
Total		12	04	04	20	400						100			
Semester Total		**20**			**20**	**500**									

Appendix - A

Two Years Post Graduate Degree Program in the Faculty of Engineering and Technology
Course and Examination Scheme with Credit Grade System
III - Semester M. Tech. (CAD/CAM)

Course Code	Course Title	Teaching Scheme				Examination Scheme									
		Hours per week			No. of Credits	Theory Course						Laboratory Course			
		L	T	P/D		Duration of Paper (Hrs.)	Max. Marks	Max. Marks		Total	Min. Passing Marks	Max. Marks	Max. Marks	Total	Min. Passing Marks
								Internal Assessment							
							ESE	MSE	IE			TW	POE		
1101	Negotiated Studies	-	4	-	4	-	-	-	100	100	50	-	-	-	-
1102	Self Study Laboratory	-	-	4	4		-	-	-	-	-	50	50	100	50
1103	Pre-Dissertation	-	-	12	12	-	-	-	-	-	-	300	-	300	150
Total		-	4	16	20	-						500			
Semester Total		**20**			**20**	**500**									

IV - Semester M. Tech. (CAD/CAM)

Course Code	Course Title	Teaching Scheme				Examination Scheme									
		Hours per week			No. of Credits	Theory Course						Laboratory Course			
		L	T	P/D		Duration of Paper (Hrs.)	Max. Marks	Max. Marks		Total	Min. Passing Marks	Max. Marks	Max. Marks	Total	Min. Passing Marks
								Internal Assessment							
							ESE	MSE	IE			TW	POE		
1201	Final Dissertation	-	-	20	20	-	-	-	-	-	-	250	250	500	250
Total		-	-	20	20	-						500			
Semester Total		**20**			**20**	**500**									

GONDWANA UNIVERSITY, GADCHIROLI

Name of the Program: **I Semester M. Tech. (CAD/CAM)**
Course Code: **901**
Course Title: **Data Structures and Algorithms**

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
03	01	-	04	04	03	10	20	70	100

Contents

Review of basic Concepts of OOPs, objects, classes, polymorphism, and inheritance.

Introduction to Data Structures, abstract data types, array as an ADT, using one-dimensional arrays, arrays as parameters, character string operations, multi-dimensional arrays, structures and classes.

Stack and its Application, Definition and Examples, Primitive Operations, Recursion, Fibonacci sequence, Binary Search, Recursive Chains, Recursive Definition of Algebraic Expressions.

Queues and Lists, The Queues representation Insert Operation, Priority Queue, Array Implementation of a Priority queue, Linked Lists, Inserting and removing Nodes from a List, Linked Implementation of Stacks, Linked Implementation of Queues, Linked List as a data structure, Non integer and Non homogeneous Lists, Dynamic and Array Implementation of Lists, Simulation Using Linked Lists simulation process, data structures, Other List Structures, Circular Lists, Doubly Linked Lists , Multiple Linked lists.

Trees, Binary Trees Operations, Applications Representations of Binary Tree. Internal and External Nodes, Implicit Array Representation of Binary Trees, Choosing a Binary Tree Representation, Binary Tree Traversals, Heterogeneous Binary Trees, Sorting, Efficiency Considerations, O Notation, Efficiency of Sorting, Exchange Sorts, Bubble sort, Quicksort, Selection and Tree Sorting, Straight Selection Sort, Binary Tree sorts, Heapsort, Insertion Sorts, Simple Insertion, Shell Sort, Searching, Basic Search Techniques, Algorithmic Notation, Sequential Searching, Reordering a List Searching an Ordered Table, Indexed Sequential Search, Binary Search, Interpolation Search, Tree Searching, Inserting/deleting in a Binary Search Tree.

Books for Reference:

1. Langsam Y., Augenstein M. J. And Tenenbaum A. M., “Data Structures Using C and C++”, Prentice Hall of India Pvt. Ltd.
2. Trembly J. P. And Sorenson P. G., “An Introduction to Data Structures with Applications”, Tata McGraw Hill Pub. Co. Ltd.
3. Horowitz E. And Sahani S., “Fundamentals of Computer Algorithms”, Galgotia Publications Ltd.

Name of the Program: **I Semester M. Tech. (CAD/CAM)**
Course Code: **902**
Course Title: **CNC and Robotics**

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
03	01	-	04	04	03	10	20	70	100

Contents

Concepts of NC, CNC, DNC. Classification of CNC machines, Machine configurations, Types of control, CNC controller characteristics, Interpolators.

Cutting tool materials, carbide inserts classification, qualified; semi qualified and preset tooling, tooling system for Machining centre and Turning centre, work holding devices of CNC Machines.

Programming CNC machines, Part print analysis and Process planning, Advanced Programming features, Canned cycles, Subroutines, Macros, special cycles etc. APT part programming using CAD/CAM, Parametric

Programming.

Manual part programming for CNC turning, milling and machining center. Wire EDM machines. Computer assisted part programming techniques, Conversational and Graphics based software, Solids based part programming. Freeform surface machining. Simulation and Verification of CNC programs, Adaptive CNC control techniques. Integration of CNC machines for CIM

.

Robotics, Basic concepts, Robot configurations, Basic robot motions, Types of drives, and Applications

Transformations and kinematics, Vector operations, Translational transformations and Rotational transformations, Properties of transformation matrices, Homogeneous transformations and Manipulator, Forward solution, Inverse solution. Controls and end effectors, Control system concepts, Analysis, control of joints, Adaptive and optimal control

End effectors, Classification, Mechanical, Magnetic Vacuum, Adhesive, Drive systems, Force analysis and Gripper design. Robot programming, Methods, Languages, Computer control and Robot Software – Programming Languages.

Sensory devices, Non optical and optical position sensors, Velocity and Acceleration, Range, Proximity, touch, Slip, Force,Torque. Machine vision, Image components, Representation, Hardware, Picture coding, Object recognition and categoristaion. Integration of Robots with CNC machines for CIM.

Books for Reference:

1. Krar, S., and Gill, A., "CNC Technology and Programming", McGraw Hill publ Co, 1990.
2. Gibbs, D., "An Introduction to CNC Machining", Casell, 1987.
3. Lynch, M., "Computer Numerical Control for Machining", McGraw Hill, 1992.
4. Koren Y, "Computer Control of Manufacturing Systems", McGraw, 1986.
5. Fu K.S., Gonzalez R.C., and Lee C.S.G.," Robotics control, sensing, vision, and intelligence", McGraw-Hill Book Co., 1987.
6. Klafter R.D., Chmielewski T.A. and Negin M.," Robot Engineering An Intergrated approach", Prentice Hall of India, New Delhi, 1994.
7. Deb S.R., "Robotics Technology and Flexible Automation", Tata McGraw-Hill Publishing Co.,Ltd., 1994.
8. Craig J.J., "Introduction to Robotics Mechanics and Control", Addison-Wesley, 1999.

Name of the Program: **I Semester M. Tech. (CAD/CAM)**
Course Code: **903**
Course Title: **Product Design & Development**

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
03	01	-	04	04	03	10	20	70	100

Contents

Importance of product design, types of design, product definition, product specification, Phases of product development: conceptual, embodiment and detailed design, product and technology development cycle, concept generation and evaluation methods.

Material selection – Importance, classification, material performance characteristic, Selection criteria.

Process selection – Important types of manufacturing processes and their classification, sources of information, selection criteria, Material and Process selection Methods- Expert systems, Computer Database Approach, Performance indices, decision matrix, AHP and fuzzy approach, introduction to material and process selection software.

Benchmarking – DFM, DFA, DFX, Early supplier involvement, robust design, QFD and concurrent engineering.

Industrial Engineering Approach, Parametric Approach, Introduction to Assembly Modelling, Top-Down and Bottom-Up Approaches of AM, Mating Conditions, Representation Schemes, Generations of Assembly Sequences.

Product Development Cycle and Importance of Prototyping, Types of Prototypes, Principle and Advantages & Different Type of Generative Manufacturing Process, Viz, Stereolithography, FDM, SLS etc. Factors Concerning to RP: Consideration for Adoptions, Advantages, Accuracy and Economic Considerations.

Books for Reference:

1. Dieter George E. "Engineering Design", McGraw Hill Pub. Company, 2000
2. Ulirich Karl T. and Eppinger Steven D., "Product Design and Development" McGraw Hill Pub. Company, 1995.
3. Bralla, James G., "Handbook of Product Design for Manufacturing" McGraw Hill Pub. Company, 1986
4. Ibrahim Zeid, "CAD/CAM", Tata McGraw Hill Pub.
5. Martti Mantilya, "An Introduction to solid modeling", Computer Science Press.
6. Rogers Adams, "mathematical aspects of Computer Graphics" McGraw Hill Pub.
7. Kevin Otto, Kristin Wood "Product Design" Pearson Education Pub.

Name of the Program: **I Semester M. Tech. (CAD/CAM)**
Course Code: **904**
Course Title: **Computer Graphics for CAD/CAM**

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
03	01	-	04	04	03	10	20	70	100

Contents

Role of Computer Graphics in CAD/CAM., Fundamentals of 2D graphics, Menu design and Graphical User Interfaces (GUI), Customisation and Parametric programming.

Vector representation of geometric entities, lines, circle, arc, conics. Homogeneous coordinate systems, Geometric transformations, 2D and 3D.Orthographic and Perspective projection. Hidden line removal algo's, Window and Clipping Algorithms.

Planar and Space curve design, Analytical and Synthetic approaches, parametric and implicit equations.

Surface of revolution, sweep surfaces, ruled and developable surfaces, Modelling of bi parametric freeform surfaces ,Coons, Bezier, B-spline, Rational B-Splines and NURBS surface patches, Surface manipulation techniques.

Geometric modelling techniques, Wireframe modelling. Solid Modelling, B-Rep, CSG and Hybrid modelers.

Feature based, Parametric and Variational modelling.

Books for Reference:

1. Faux, I.D. and Pratt, M.J. "Computational Geometry for Design and manufacture", John Wiley & Sons, NY, 1979
2. Mortenson, M.E., "Geometric Modelling", John Wiley & Sons, NY, 1985.
3. Martti Mantilya, "An Introduction to Solid Modeling" Computer Science Press
4. Ibrahim Zeid, "CAD/CAM" TMH
5. Rogers D F I and Adams J A, "Mathematical Elements for Computer Graphics", McGraw-Hill, 1996
6. Multineux, "CAD -Computational Concepts and Methods", Kogan Page Ltd, 1984
7. Hoschek J, Dieter L, "Fundamentals of Computer Aided Geometric Design", A K Peters, 1997
8. Rogers, "Procedural Elements for Computer Graphics", TMH
9. Harrington, "Computer Graphics: A programming Approach", Mc-Graw Hill
10, J.D. Foley, " Computer Graphics – Principles & Practice, Pearson Education

Name of the Program: **I Semester M. Tech. (CAD/CAM)**
Course Code: **905**
Course Title: **CAM Lab.**

Course Scheme					Examination Scheme		
Lecture	Tutorial	Practical	Periods per week	Credits	TW	POE	Total
-	-	04	04	04	50	50	100

Student is expected to perform at least eight Practicals from the following.

1. Generation of part programs on CNC Lathe machine to perform the following operations:
   i) Step Turning
   ii) Taper Turning
2. Part program for thread cutting using Canned cycle
3. Generation of part programs on CNC drilling machine
4. Generation of part programs on CNC milling machine to perform
   i) Slot milling
   ii) End milling
5. Cutting tool path generation using any one simulation package for different machining operations
6. Graphical simulation of tool path
7. Robot Programming
8. Any other relevant practicals related to CAM

Name of the Program: **II Semester M. Tech. (CAD/CAM)**
Course Code: **1001**
Course Title: **Computer Integrated Manufacturing System**

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
03	01	-	04	04	03	10	20	70	100

Contents

Computer Integrated Manufacturing:

Concept and scope of CIM, components of CIM, benefits, limitations. Introduction to Group Technology, Limitations of traditional manufacturing systems, characteristics and design of groups, benefits of GT and issues in GT. Part families , classification and coding , Production flow analysis , Machine cell design , Benefits.

Introduction & Components of FMS, Application, work stations, Computer control and functions, Planning, scheduling and control of FMS, Scheduling, Knowledge based scheduling, Hierarchy of computer control, Supervisory computer. Manufacturing data systems, data flow, CAD/CAM considerations, Planning FMS database.

Automated material handling systems, AS/RS, general considerations, selection, evaluation and control . Inspection and Quality control, CAQC ,CMM types, working, applications.

Process Planning and Concurrent Engineering, CAPP, Variant process planning , Generative approach , Forward and Backward planning, Input format, Agile Manufacturing, Nano Manufacturing.

Manufacturing System Integration & Management:
Computer integrated Production management Systems, Master Production Schedule, Capacity Planning, Shop Floor Control: Functions, Order Release, Order Scheduling, Order progress. Factory Data Collection: Purpose, Characteristics. Aggregate Planning, Methods, MRP: Inputs To MRP, MRP Logic, Planning Factors, Outputs From MRP, Resource Planning. Manufacturing Resources Planning(MRP II) : Framework Of MRP II System , Elements Of MRP II, Resources Requirement Planning, Demand Management, Master Production Scheduling

and Final Assembly Scheduling, Rough Cut Capacity Planning, Material Requirement Planning, Capacity Requirements Planning, Plant And Supplier Scheduling, Problems Associated With MRP II, Benefit And Prospects For MRP II.

JIT principles, The Meaning of JIT, Small Lot Production, Setup Time Reduction, Pull Production: Production Control Systems, Pull And Push System, Process Improvement, Necessary Conditions For Pull Production Systems, How To Achieve Pull Production, Production Planning and Scheduling Under Different Circumstances, Factory Coordination, Production Environment Design, Production Activity Control, Scheduling, Input Output Control, Plant Scheduling, KANBAN.

Books for References:

1. Bubidge, J.L. "Group Technology in Engineering Industry" Mechanical Engineering Pub, London, 1979.
2. Askin, R.G. and Vakharia, A. J. "G. T. Planning and Operation, in the Automated Factory- Hand book: Technology and Management" , Cleland, D. I. And Bidananda, B (Eds), TAB Book, NY 1991.
3. Nicholes John M. "Competitive Manufacturing Management" McGraw Hill International Editions
4. Khalid Shiekh, "Manufacturing Resource Planning" Tata McGraw Hill Co. Ltd.
5. James M. Moore, "Plant Layout and Design", McMillan Publishing Company
6. Nanua Singh,"Systems Approach to Computer Integrated Design and Manufacturing", John Wiley & Sons, 1996.
7. Groover M.P., "Automation, Production Systems and Computer Integrated Manufacturing", Prentice-Hall of India Pvt. Ltd., New Delhi, 2002
8. Jha, N.K., "Handbook of Flexible Manufacturing Systems", Academic Press Inc., 1991.
9. Irani, S.A. "Cellular Manufacturing Systems", Hand Book.

Name of the Program: **II Semester M. Tech. (CAD/CAM)**
Course Code: **1002**
Course Title: **Product Data Management**

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
03	01	-	04	04	03	10	20	70	100

Contents

Purpose of Database Systems, Data Models, Database Languages, Database Users, Overall System Structure.

Design Issues: Mapping Constraints, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R Features, Design of an E-R Database Schema.
Structure of Relational Databases, The Relational Algebra, The Tupple Relational Calculus, The Domain Relational Calculus, Modifications of the Database.

Basic Structure, Relational Algebra Operations, Set Operations, Aggregate Functions, Group By and Order By clauses, Null Values, Nested Sub queries, Derived Relations, Views, Modification of the Database, Joined Relations, Data-Definition Language, Other Relational Languages - Query-by-Example, PL/SQL.

Domain Constraints, Referential Integrity, Assertions, Triggers, Functional Dependencies
Pitfalls in Relational-Database Design, Decomposition, Normal forms, Normalization Using Functional Dependencies.

Indexing and Hashing: Indexing techniques, Types of Indices, Ordered Indices, Hashing, Centralized Systems, Client-Server Systems, Parallel Systems, Distributed Systems, Network Types, Parallel Databases, Distributed Databases, Security and Integrity, Standardization.

Expert Database Architectures, Semantic Data Models.

Decision-Support Systems, Data Analysis, Data Warehousing, Spatial and Geographic Databases, Multimedia Databases, Mobility and Personal Databases, Information-Product Design Databases, CAD-CAM Data Management Requirements, Databases for Shop floor control and Factory information system, Enterprise Resource Planning, Database requirements of Computer Integrated Manufacturing.

Books for Reference:

1. Abraham Silberschatz, Henry F. Korth, S.Sudarshan, "Database System Concepts", McGraw Hill International Editions, Third Edition
2. P. Beynon-Davies, "Expert Database Systems – A Gentle Introduction", McGraw Hill International, 1991
3. James Martin ,"Database Management Systems",
4. Mark Swank and Drew Kittel , "Worldwide Web - Database Developer's Guide"
5. Fredrick H.Jones and Lloyd Martin "The AutoCAD Database Book - Accessing and Managing CAD Drawing Information", Galgotia Publications, Third Edition.

Name of the Program: **II Semester M. Tech. (CAD/CAM)**
Course Code: **1003**
Course Title: **Finite Element Method**

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
03	01	-	04	04	03	10	20	70	100

Contents

Basics of Theory of Elasticity - Elasticity, Stress, Notation for Forces & Stresses, Components of Stress, Components of Strain, Hookes Law, Plane Stress, Plane Strain, Stress at a point, Strain at a point, Differential Equation of Equilibrium, Boundary Conditions, Compatibility Equations, Stress Functions & its applications.

Basics of FEM – Review of finite difference method, Initial value and boundary value problems - weighted residual, Galerkin and Raleigh Ritz methods. Review of Variational calculus, Basics of variational formulation.

Steps in FEA, Discretization, Interpolation, derivation of element characteristic matrix, shape function.

Assembly and imposition of boundary conditions - Solution and post processing - One dimensional analysis in solid mechanics and heat transfer.

Global and Natural co-ordinates - Shape functions for one and two dimensional elements - Three nodded triangular and four noded quadrilateral element - Non linear analysis - Isoparametric elements – Jacobian matrices and transformations - Basics of two dimensional axi-symmetric analysis.

Pre Processing, Mesh generation, element connecting, boundary conditions, input of material and processing characteristics – Solution and post processing - Overview of application packages.

Applications of FE analysis in Structural, Modal analysis, Heat Transfer Analysis etc.

Books for Reference:

1. O.C. Zienkiewicz ,"The Finite Element Method".
2. C.S. Krishnamurthy, "Finite Element Analysis : Theory & Programming", TMH Publishing Co.
3. S.S. Rao ,"The Finite Element Method in Engineering", Pergamon Press.
4. J.N. Reddy , "Finite Element Method" , McGraw Hill Int.
5. Ozisik, "Heat Transfer".
6. S.P. Timoshenko, Theory of Elasticity, Mc-Graw Hill
7. Dixit U.S., "Finite Element Methods for Engineers", Cengage Learning

Name of the Program: **II Semester M. Tech. (CAD/CAM)**
Course Code: **1004**
Course Title: **Elective: Computer Aided Tool Design**

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
03	01	-	04	04	03	10	20	70	100

Contents

Press working, Types of Presses, Types of dies, Computer aided design of cutting dies like simple die, compound die, progressive die and combination die.

Forming dies like bending die, drawing die, flanging die, coining die, embossing die.

Jigs and fixtures, principles of location and clamping, unconventional clamping systems.

Design of various types of jigs for various parts.

Design of different types of fixtures.

Taylor's principles of gauge design. Design of limit gauges.

Forging in Plane strain, Forging of circular disc, Effect of friction, Forging equipment, defects in forged products: Causes & Remedies. Design of forging dies.

Mechanics of metal cutting. Design of single point tools. Design of multipoint cutting tools like drills, reamers, broaches, taps and milling cutters.

Design of tools for joining processes.

Design of tools for NC, CNC machines.

Books for reference:

1. Donaldson, "Tool design"
2. ASTME, "Fundamentals of Tool design"
3. Pollock, "Fundamentals of Tool design"
4. Grant, "Unconventional Clamping Systems"
5. Kempster, "Fundamentals of Tool design"

Name of the Program: **II Semester M. Tech. (CAD/CAM)**
Course Code: **1004**
Course Title: **Elective: Total Quality Systems & Engineering**

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
03	01	-	04	04	03	10	20	70	100

Contents

Principles of Quality Management, Pioneers of TQM, Quality costs, Quality system, Customer Orientation, Benchmarking, Re-engineering.

Leadership, Organizational Structure, Team Building, Information Systems and Documentation, Quality Auditing, ISO 9000, QS 9000, Quality Awards.

Single Vendor Concept, J.I.T., Quality Function Deployment, Quality Circles, KAIZEN, POKA -YOKE, Taguchi Method.

Methods and Philosophy of Statistical Process Control, Control Charts for Variables and Attributes.

Cumulative sum and exponentially weighted moving average control charts, Others SPC Techniques, Process Capability Analysis.

Acceptance Sampling - Problem, Single Sampling Plans for attributes, double, multiple and sequential sampling.

Six-Sigma manufacturing concept.

Books for Reference:

1. Mohamed Zairi, "Total Quality Management for Engineers", Woodhead Publishing Limited 1991.
2. Harvid Noori and Russel, "Production and Operations management - Total Quality and Responsiveness", McGraw-Hill Inc, 1995.
3. N.Logothetis, "Managing for Total Quality", Prentice Hall of India Pvt .Ltd,1998
4. John Bank, "The Essence of Total Quality Management", Prentice Hall of India Pvt. Ltd., 1995.
5. Douglus C. Montgomery, "Introduction to Statistical Quality Control", 2nd Edition, John Wiley and Sons, 1991.
6. Grant E.L and Leavensworth, "Statistical Quality Control", McGraw-Hill, 1984. M. Imai, " Kaizen",

Name of the Program: **II Semester M. Tech. (CAD/CAM)**
Course Code: **1004**
Course Title: **Elective: Mechatronics**

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
03	01	-	04	04	03	10	20	70	100

Contents

Introduction to Mechatronics - Systems - Mechatronics in Products - Measurement Systems - Control Systems - Traditional design and Mechatronics Design.

Introduction - Performance Terminology - Displacement, Position and Proximity - Velocity and Motion – Fluid pressure - Temperature sensors - Light sensors - Selection of sensors - Signal processing - Servo systems.

Introduction - Architecture - Pin configuration - Instruction set - Programming of Microprocessors using 8085 instructions - Interfacing input and output devices - Interfacing D/A converters and A/D converters -Applications - Temperature control - Stepper motor control - Traffic light controller.

Introduction - Basic structure - Input / Output processing - Programming -Mnemonics Timers, Internal relays and counters - Data handling - Analog input / output - Selection of PLC.

Designing - Possible design solutions - Case studies of Mechatronics systems.

Books for reference:

1. Michael B.Histand and David G. Alciatore, "Introduction to Mechatronics and Measurement Systems", McGraw-Hill International Editions, 1999.
2. Bradley, D.A., Dawson, D, Buru, N.C. and Loader, A J., "Mechatronics", Chapman and Hall, 1993.
3. Ramesh.S, Gaonkar, "Microprocessor Architecture, Programming and Applications", Wiley Eastern, 1998.
4. Lawrence J.Kamm, "Understanding Electro-Mechanical Engineering, An Introduction to Mechatronics" , Prentice-Hall, 2000.
5. Ghosh, P.K. and Sridhar, "Introduction to Microprocessors for Engineers and Scientists", Second Edition, Prentice Hall, 1995.

Name of the Program: **II Semester M. Tech. (CAD/CAM)**
Course Code: **1004**
Course Title: **Elective: Modeling & Simulation**

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
03	01	-	04	04	03	10	20	70	100

Contents

Introduction to simulation as a tool, Areas of application, System model, Components of system, System environment, Types of system model, Steps in a simulation study.

Discrete event system simulation, Event scheduling, Time advance mechanism, List processing - basic properties and operations, Dynamic allocation, linked lines.

Characteristics of queuing systems, Transient and steady-state behaviour, Long-run performance measures, Infinite-population steady-state models, Finite-population models.

Properties and generation of random numbers, Testing of generated random numbers. Random Variate Generation : Exponential, Uniform, Weibull, Triangular, Empirical, Discrete distributions, Direct transformation for normal distribution, Convolution method, Acceptance-rejection technique, Data collection, Identifying distributions, Parameter estimation, Goodness-of-fit tests, Multivariate and time series input models.
Model building, Verification, Validation process, Verification of simulation models, Calibration and validation of models: Validation of assumptions, Input-output transformations, Validation of input-output using historical data and turning test.

Modeling manufacturing systems, Material handling system, Goals and performance measures, Modeling down times and failures, Trace-driven models, Case studies of manufacturing and Material Handling systems.

Statistical procedures for comparing real world observations and simulation output data.
Simulation Languages, introduction to SIMLIB, SIMAN, SIMSCRIPT, SLAM-II, Promodel, General description, Action times, Succession of events, Choice of paths, Simulation of Mfg. shop, Facilities & storages, Gathering statistics, Conditional transfers, Program control statements, GPSS examples.

Books for Reference:

1. J. Banks “Discrete-Event System Simulation”, PHI.
2. S. Law ,”Simulation Modeling and Analysis”, McGraw Hill Publishing Co.
3. N. Deo , “Discrete Simulation using Digital Computers”.
4. J. Gordon , “System Simulation”, PHI
5. A.M.Law & W.D. Keltron, “Simulation Modeling & Analysis” , McGraw Hill International series.
6. Mikell P. Groover, “Automation, Production Systems and Computer Integrated Manufacturing”, Prentice Hall Of India Pvt. Ltd.

Name of the Program: **II Semester M. Tech. (CAD/CAM)**
Course Code: **1005**
Course Title: **CAD Lab**

Course Scheme					Examination Scheme		
Lecture	Tutorial	Practical	Periods per week	Credits	TW	POE	Total
-	-	04	04	04	50	50	100

Student is expected to perform at least eight practicals from the following.

1. Scan Conversion for Geometric entities like Line, Circle, Ellipse, etc (using C Programming)
2. 2-D & 3-D Transformations (using C Programming)
3. Clipping Lines & Polygons (using C Programming)
4. Curve generation - like Spline, Bezier Curve etc. (using C Programming)

5. Finite Element Modelling and Analysis using 1-D Bar, Truss & CST element using any FE software.
6. Any other relevant practicals related to CAD

Name of the Program: **III Semester M. Tech. (CAD/CAM)**
Course Code: **1101**
Course Title: **Negotiated Studies**

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
-	04	-	04	04	-	-	100	-	100

Student is expected to select a subject of study as per the guidelines stated below.

1. The subject should be a good published research paper from a leading National/International Journal of the relevant discipline.
2. Student should prepare a review article based on selected topic by referring research paper & should also give presentation on it.
3. Note that, the topic shall be different from the one intended for the dissertation work during Third & Fourth Semester.

The evaluation for this course will be on the basis of Report, Seminar & Viva-Voce.

Name of the Program: **III Semester M. Tech. (CAD/CAM)**
Course Code: **1102**
Course Title: **Self Study Laboratory**

Course Scheme					Examination Scheme		
Lecture	Tutorial	Practical	Periods per week	Credits	TW	POE	Total
-	-	4	04	04	50	50	100

Student is expected to carry out the Self Learning of CAD/CAM/CAE Software Packages. Evaluation for this course shall be made based on submitted Assignments, Presentation & Viva-Voce.

A) Self study of Solid Modeling Package/s & submission of assignment/s, which includes the following.

- Surface modeling
- Solid Modeling
- Drafting and Assembly

B) Self study of Finite Element Analysis Package/s along with Pre-Post package/s & submission of assignment/s based on any of the following types of analysis.

- Static Analysis
- Dynamic Analysis
- Linear Buckling Analysis
- Thermal Analysis
- CFD
- Fatigue Analysis

Evaluation of Self Study Course will be on the basis of Report, Seminar & Viva-Voce.

Reference Books:

1. User Manual of Concerned Software Package
2. Command Manual of Concerned Software Package
3. Tutorial Book of Concerned Software Package

Name of the Program: **III Semester M. Tech. (CAD/CAM)**
Course Code: **1103**
Course Title: **Pre - Dissertation**

Course Scheme					Examination Scheme		
Lecture	Tutorial	Practical	Periods per week	Credits	TW	POE	Total
-	-	12	12	12	300	-	300

Student is expected to choose the topic of his dissertation. The scope of proposed work must be in the relevant area. Student is expected to carry out the following.

1. Selection of Topic of Dissertation
2. Literature Review related to proposed work
3. Formulation of Scope & Methodology of proposed work.
4. Formulation of Hypothesis for proposed work.
5. Preliminary Dissertation Work

Student should prepare & submit a Pre-Dissertation report covering the above work.
Evaluation will be on the basis of Report, Seminar & Viva-Voce.

Name of the Program: **IV Semester M. Tech. (CAD/CAM)**
Course Code: **1201**
Course Title: **Final Dissertation**

Course Scheme					Examination Scheme		
Lecture	Tutorial	Practical	Periods per Week	Credits	TW	POE	Total
-	-	20	20	20	250	250	500

Student is expected to carry out further work on the topic of his dissertation selected in Third Semester. A report should be prepared & submitted in prescribed format. A Pre-Submission Seminar should be also presented.

Evaluation will be on the basis of Report, Seminar & Viva-Voce.