GONDWANA UNIVERSITY, GADCHIROLI

MASTER OF TECHNOLOGY IN CAD/CAM

(TWO YEARS COURSE IN FACULTY OF ENGINEERING & TECHNOLOGY)

COURSE AND EXAMINATION SCHEME WITH CHOICE BASED CREDIT SYSTEM

I – SEMESTER

Unique Subject Code (USC)	Course type	Subject	Teaching Scheme				Examination Scheme									
			Hours per week			No. of Credits	Theory						Practical			
			L	Field Work/ Assignment/ Tutorial	P		Duration of Paper (Hrs.)	Max. Marks	Max. Marks Sessional		Total	Min. Passing Marks	Max. Marks	Max. Marks	Total	Min. Passing Marks
								ESE	MSE	IE			TW	PEE		
PCDS11	**C**	Data Structure & Algorithms	3	2	-	4	3	70	10	20	**100**	50	-	-	-	-
PCDS12	**C**	CNC & Robotics	3	2	-	4	3	70	10	20	**100**	50	-	-	-	-
PCDS13	**C**	Computer Graphics for CAD/CAM	3	2	-	4	3	70	10	20	**100**	50	-	-	-	-
PCDS14x	**P**	Elective - I	3	2	-	4	3	70	10	20	**100**	50	-	-	-	-
Laboratories/ Practical																
PCDS15	**C**	CAM Lab	-	-	2	1	3	-	-	-	-	-	25	25	**50**	25
PCDS16	**E**	Seminar - I	-	-	2	1	-	-	-	-	-	-	50	-	**50**	25
		TOTAL	12	08	4	18	-	**400**					**100**			
		SEMESTER TOTAL	**24**			**18**	**500**									

Elective – I (x) : (A) **Mechatronics** (B) **Total Quality Systems & Engineering** (C) **Artificial Intelligence**

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II – SEMESTER

Unique Subject Code (USC)	Course type	Subject	Teaching Scheme				Examination Scheme									
			Hours per week			No. of Credits	Theory						Practical			
			L	Field Work/ Assignment/ Tutorial	P		Duration of Paper (Hrs.)	Max. Marks			Total	Min. Passing Marks	Max. Marks	Max. Marks	Total	Min. Passing Marks
									Sessional							
								ESE	MSE	IE			TW	PEE		
PCDS21	C	Computer Integrated Manufacturing System	3	2	-	4	3	70	10	20	**100**	50	-	-	-	-
PCDS22	C	Product Data Management	3	2	-	4	3	70	10	20	**100**	50	-	-	-	-
PCDS23	C	Finite Element Method	3	2	-	4	3	70	10	20	**100**	50	-	-	-	-
PCDS24x	P	Elective – II (x)	3	2	-	4	3	70	10	20	**100**	50	-	-	-	-
Laboratories/ Practical																
PCDS25	C	CAD Lab	-	-	2	1	-	-	-	-	-	-	25	25	**50**	25
PCDS26	E	Seminar - II	-	-	2	1	-	-	-	-	-	-	50	-	**50**	25
TOTAL			12	08	4	18	-	**400**					**100**			
SEMESTER TOTAL			**24**			**18**	**500**									

Elective –II (x) : **(A) Computational Fluid Dynamics (B) Product Design & Development (C) Computer Aided Tool Design**

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COURSE AND EXAMINATION SCHEME WITH CHOICE BASED CREDIT SYSTEM

III – SEMESTER

Unique Subject Code (USC)	Course type	Subject	Teaching Scheme				Examination Scheme									
			Hours per week			No. of Credits	Theory						Practical			
			L	Field Work/ Assignment/ Tutorial	P		Duration of Paper (Hrs.)	Max. Marks	Max. Marks Sessional		Total	Min. Passing Marks	Max. Marks	Max. Marks	Total	Min. Passing Marks
								ESE	MSE	IE			TW	PEE		
PCDS31	**C**	Self Study Course	3	2	-	4	3	70	10	20	**100**	50	-	-	-	-
PCDS32x	**P**	Elective - III	3	2	-	4	3	70	10	20	**100**	50	-	-	-	-
Laboratories/ Practical																
PCDS33x	**E**	Grand Seminar / Industrial Training	-	10	-	5	-	-	-	-	-	-	100	-	**100**	50
PCDS34	**E**	Pre-Dissertation	-	10	-	5	-	-	-	-	-	-	200	-	**200**	100
TOTAL			6	24	-	18	-	**200**					**300**			
SEMESTER TOTAL			**30**			**18**	**500**									

Elective – III (x) : A) Pattern Recognition (BOS of Computer Science/Tech/Engg) B) Modeling and Simulation C) Soft Computing (BOS of Computer Science/Tech/Engg)

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COURSE AND EXAMINATION SCHEME WITH CHOICE BASED CREDIT SYSTEM

IV – SEMESTER

Unique Subject Code (USC)	Course type	Subject	Teaching Scheme				Examination Scheme								
			Hours per week			No. of Credits	Theory					Practical			
			L	Field Work/ Assignment/ Tutorial	P		Duration of Paper (Hrs.)	Max Marks	Max. Marks Sessional		Total	Min Passing Marks	Max Marks	Max Marks	Total	Min. Passing Marks
								ESE	MSE	IE			TW	PEE		
PCDS41	E	Final Dissertation	-	24		18	-						250	250	500	250
TOTAL				24		18	-						550			
SEMESTER TOTAL				24		18	500									

GONDWANA UNIVERSITY, GADCHIROLI

Name of the Program : I Semester M. Tech. (CAD/CAM)
Course Code : PCDS11
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	02	-	-	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

GONDWANA UNIVERSITY, GADCHIROLI

Name of the Program : I Semester M. Tech. (CAD/CAM)
Course Code : PCDS12
Course Title : CNC & Robotics

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
03	02	-	-	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.

GONDWANA UNIVERSITY, GADCHIROLI

Name of the Program : I Semester M. Tech. (CAD/CAM)
Course Code : PCDS13
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	02	-	-	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

GONDWANA UNIVERSITY, GADCHIROLI

Name of the Program : I Semester M. Tech. (CAD/CAM)

Course Code : PCDS141

Course Title : Elective I - Mechatronics

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
03	02	-	-	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

GONDWANA UNIVERSITY, GADCHIROLI

Name of the Program : I Semester M. Tech. (CAD/CAM)
Course Code : PCDS142
Course Title : Elective I – Total Quality Systems and Engineering

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
03	02	-	-	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”,

GONDWANA UNIVERSITY, GADCHIROLI

Name of the Program : I Semester M. Tech. (CAD/CAM)
Course Code : PCDS143
Course Title : Elective I – Artificial Intelligence

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
03	02	-	-	04	03	10	20	70	100

Contents :

Human and machine intelligence, Artificial Intelligence (AI), Programming in AI environment,. Natural

Language processing (NLP)

Architecture of an Expert system, Knowledge base, inference engine forward and backward

chaining, use of probability and fuzzy logic. Selection of inference mechanism.

Introduction, to Rule Based System, Conflict Resolution, Advantages and Drawbacks of Rule Based

Systems Clausal Form Logic; Rule Base Verification, Refinement and Validation

Creating Knowledge Base, Knowledge Engineer and Domain Expert, Phases of

Knowledge Engineering, Tools for Knowledge Engineering

Neural network applications, artificial neural network models, NN applications in Cellular

manufacturing and other areas of mechanical Engg.

Fundamentals of OOP (Object oriented programming), creating structures and objects,

object operations, invoking procedures, programming applications, Object oriented expert

systems.

Semantic nets, structure and objects, ruled systems for semantic nets, certainty factors, automated learning;

Books for Reference :

1. Addis, T.R., "Designing Knowledge Based System", Prentice Hall, 1985.
2. Rolston, D.W., "Principles of Artificial Intelligence and Expert Systems Development", McGraw Hill, 1988.
3. Maus, R. and Keyes, J., "Handbook of Expert Systems in Manufacturing", McGraw Hill, 1991
4. Robert Levine, "A comprehensive guide to artificial intelligence and expert systems",
5. Elain Rich ,"Artificial Intelligence",
6. Sasikumar, Ramani, et al ,"Rule based expert systems".
7. Graham Winstanley, "Program Design for Knowledge Based Systems", Galgotia Publications.
8. Artificial Neural Networks", Zurada
9. V.B. Rao and H.V. Rao, "C^{++} : Neural Networks and Fuzzy Logic", BPB Publications.

Name of the Program : I Semester M. Tech. (CAD/CAM)
Course Code : PCDS15
Course Title : CAM Laboratory

Course Scheme					Examination Scheme							
					Theory					Practical		
Lecture	Tutorial	Practical	Periods per Week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total	Max. Marks	TW	PPE
-	-	2	-	1	-	-	-	-	-	50	25	25

Contents

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 : Semester M. Tech. (CAD/CAM)

Course Code : PCDS16

Course Title : Seminar - I

Course Scheme					Examination Scheme								
						Theory					Practical		
Lecture	Tutorial	Practical	Periods per Week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total	Max. Marks	TW	PPE	Min. Passing Marks
-	-	2	-	1	-	-	-	-	-	50	50	-	25

Contents :

Student is required to select appropriate topic related to the course work. Topic should be approved from the coordinator. Student have to deliver the seminar and submit the report for final evaluation with minimum 25 pages in the prescribed format.

Name of the Program : II Semester M. Tech. (CAD/CAM)

Course Code : PCDS21

Course Title : Computer Integrated Manufacturing Systems

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
03	02	-	-	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 : PCDS22

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	02	-	-	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 : PCDS23
Course Title : Finite Element Methods

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
03	02	-	-	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 : PCDS241

Course Title : Elective – II Computational Fluid dynamics

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
03	02	-	-	04	03	10	20	70	100

Contents :

Governing equations of fluid flow & heat transfer, continuity, momentum, and energy equation, equation of state. Conservative forms of the governing equations. Navier-Stokes' Equations for a Newtonian fluid. Classification of physical behaviors: Elliptical, Parabolic & Hyperbolic Equations. Finite Volume Method (FVM) for Steady & Unsteady flows. Turbulence & its Modeling. Implicit & Explicit Solution Algorithms. Solution algorithms for pressure-velocity coupling in steady flows. Initial & Boundary Conditions. Grid Generation Techniques. Uncertainty Analysis.Case studies using CFD codes.

Text Books:

1. An Introduction to Computational Fluid Dynamics, Date A.W., Cambridge University Press Publication.

2. Basics of Computational Fluid Dynamics, Niyogi P., Chakrabartty S.K. & Laha M.K., Pearson Prentice Hall Publication.

Reference Books:

1. Computational Fluid Dynamics –The Basics with Applications, Anderson J.D., Mc Graw Hill Publication.

2. An Introduction to Computational Fluid Dynamics, H. Versteeg & W. Malalasekra, Pearson Prentice Hall Publication

Name of the Program : II Semester M. Tech. (CAD/CAM)
Course Code : PCDS242
Course Title : Elective – II Product Design & Development

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
03	02	-	-	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 : II Semester M. Tech. (CAD/CAM)
Course Code : PCDS243
Course Title : Elective – II Computer Aided Tool Design

Course Scheme					Examination Scheme				
Lecture	Tutorial	Practical	Periods per week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total
03	02	-	-	04	03	10	20	70	100

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

Course Code : PCDS25

Course Title : CAD Laboratory

Course Scheme					Examination Scheme								
					Theory					Practical			
Lecture	Tutorial	Practical	Periods per Week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total	Max. Marks	TW	PPE	Min. Passing Mark
-	-	2	-	1	-	-	-	-	-	50	25	25	25

Contents :

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 : IISemester M. Tech. (CAD/CAM)

Course Code : PCDS26

Course Title : Seminar – II

Course Scheme					Examination Scheme							
					Theory					Practical		
Lecture	Tutorial	Practical	Periods per Week	Credits	Duration of Paper, Hrs	MSE	IE	ESE	Total	Max. Marks	TW	PPE
-	-	2	-	1	-	-	-	-	-	50	50	-

Contents :

Student is required to select appropriate topic related to the course work. Topic should be approved from the coordinator. Student have to deliver the seminar and submit the report for final evaluation with minimum 25 pages in the prescribed format.