Samrat Ashok Technological Institute (Engg. College),Vidisha (M.P.)
Mechanical Engineering Department

I-SEM M.E. APS	Subject Code	Subject Name / Title	Maximum Marks Allotted					Contract Hrs. per weeks			Total Credits
			Theory			Practical					
			End Sem	Mid Sem MST	Quiz + Assignment	End Sem	Lab Work	L	T	P	
	APS-1111	Computer Aided Design	60	20	10+10	-	-	3	1	-	4

Course Outcomes:
On completion of the course, the students will be able to:

CO1	Understand and apply basic computer graphics algorithms such as DDA and Bresenham's for generating 2D and 3D figures.
CO2	Develop parametric and feature-based models using CAD tools, incorporating geometric constraints and modeling aids.
CO3	Recognize and apply CAD standards, including graphics, computing, and data exchange standards, to ensure interoperability and accuracy in design and drafting.
CO4	Evaluate the structure and application of data exchange formats like IGES and STEP in CAD/CAM systems.
CO5	Compare the features, functionalities, and applications of various commercially available CAD software solutions.

UNIT-I

Basics of Computer Aided Design: Introduction to Computer Graphics, DDA and Bresenhams algorithm for generating various figures, 2D & 3D Transformations, Basics of CAD/CAM hardware's, Representation of curves and surfaces

UNIT-II

Introduction to modeling techniques, coordinate systems, modeling features, Features entities, Drafting features, Customization, 3D sketches," Feature manipulation, Datum features, modeling Operation' Strategy, Geometric constraints, Modeling aids & tools, Generalized views, Presentation of dimensioning/ tolerances /symbols & annotation, Associatively, Parent child relationship, parametric design, programming techniques in drafting/ modeling/analysis, Concept of computer animation, properties calculation, surface design, surface theory, surface analysis, Fundamentals of solid modeling, Different approaches of creating an assembly.

UNIT-III

Standards in CAD, Graphics and · computing standards, Data exchange standards, Design database, Interfacing design and drafting, "Mechanical assembly.

UNIT-IV

CAD/CAM Exchange: Evaluation of data, Exchange format, IGES data representations and structure, STEP architecture, Implementation, ACIS.

UNIT-V

Capabilities of various commercially available softwares in the area of CAD.

BOOKS RECOMMENDED

1. Hearm Donald and Baker M. Pauline, " Computer Graphics " Prentice hall of India pvt. Ltd., 2nd Edition , 1997
2. David F. Rogers and J. Alan Adnis, "Mathematical elements for computer Graphics", McGraw Hill, 2nd Edition, 1990.
3. Zied Ibrahim "CAD/CAM Theory and Practice" McGraw Hill International Edition 1998.
4. McMohan Chris, "CAD/CAM Principles, Practice and Manufacturing'' , Prentice Hall 1999.
5. Rao P.N. "CAD/CAM: Principles and Applications" McGraw Hill Publication, 2nd Edition 2004

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			Theory			Practical					
			End Sem	Mid Sem MST	Quiz Assignment	End Sem	Lab Work	L	T	P	
	APS-1112	Advanced Manufacturing Technology	60	20	10+10	-	-	3	1	-	4

Course Outcomes:
On completion of the course, the students will be able to:

CO1	Understand Metal cutting principles and wear.
CO2	Understand and apply special machining.
CO3	Know about Unconventional machining processes.
CO4	Understand and apply different types of Rapid Prototyping process.
CO5	Understand about AI and Expert system and its analysis.

UNIT-I

Metal Cutting and Tool Materials: Orthogonal and oblique cutting, Types of tool Wear, Abrasion, Diffusion, Oxidation, Fatigue and Adhesive Wear, Prediction of tool life, Monitoring of tool wear, Cutting forces and vibration, Tool Materials: Cemented carbide, coated carbide, Cermet, Ceramic, CBN and PCD, Selection of machine parameters and tool.

UNIT-II

Special Machining: Deep hole drilling, Gun drills, Gun Boring, Trepanning, Honing, Lapping, Super finishing, Burnishing, Broaching, High speed machining.

UNIT-III

Unconventional Machining: Principles processes, various influencing parameters and Applications of Ultrasonic Machining, Electro Discharge Machining, Electro Chemical Machining, Electron and Laser Beam Machining, Plasma Arc Machining and Water Jet Machining.

UNIT-IV

Rapid Prototyping: Stereo lithography, Laminated object manufacturing, Selective laser sintering, solider, Vacuum casting, Resin injection, Applications of RPT, Surface roughness terms, Influence of machining parameters on surface roughness,. Micro finishing process.

UNIT-V

Artificial Intelligence and Expert Systems: Introduction, Pattern recognition, control strategies; Heuristic search, Forward and Backward reasoning, search algorithms, Game playing, Structural representation of knowledge, Expert systems in manufacturing.

BOOKS RECOMMENDED

1.Armarego E.J.A. and Brown R.H. "The Machining of metals'' Prentice Hall India
2. Battacharya. "Theory of metal cutting'' NCB Agency
3.HMT Manual " Non-traditional machining methods''
4.Rich E and Knight K, "Artificial Intelligence'', TMH
5. Pham D, "Expert Systems in Engineering''.IFS Publishers.
6.Durvent W.R. "The Lihographic Hand Book''. Narosa publishers 1995
7.Pandey P.S.and Shah N. "Modern Manufacturing Processes" 1980
8 Sadasivan T.A. and sarathy D. " Cutting Tools For Productive Machining" Widia Publication.

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I-SEM M.E. APS	Subject Code	Subject Name / Title	Maximum Marks Allotted					Contract Hrs. per weeks			Total Credits
			Theory			Practical					
			End Sem	Mid Sem MST	Quiz + Assignment	End Sem	Lab Work	L	T	P	
	APS-1113	Flexible Manufacturing System	60	20	10 + 10	-	-	3	1	-	4

Course Outcomes:
On completion of the course, the students will be able to:

CO1	Understand the concept of FMS.
CO2	Apply DBMS in FMS and also do part programming.
CO3	Analyze and learn Material handling system.
CO4	Evaluate Contact and non Contact inspection.
CO5	Do interfacing of computers as PLCs and CAPP.

UNIT-I

Introduction to FMS: Concepts, Advantages, Components of FMS, and their integration in the data processing systems, Examples of FMS installations.

UNIT-II

Distributed Data •. Processing in FMS: DBMS and their applications in CAD/CAM and FMS, Distributed system in FMS, Integration of CAD and CAM, Part Programming in FMS, Tool data Base, Clamping devices and Fixture Data Base.

UNIT-III

Material Handling Systems: AGV's, Features of Industrial Robots,· Robot Cell Design and Control, AS/RS.

UNIT-IV

Inspection: CMM types, Contact and non Contact inspection Principles, Programming and Operation in cycle gauging.

UNIT-V

Interfacing of Computers: Machine tool controllers and handling systems, communication standards, Programmable Logic Controllers (PLC's), Interfacing, Computer Aided Process Planning, Dynamic Part Scheduling.

BOOKS RECOMMENDED

1. Paul Ranky, ''The Design and Operation of FMS''IFS Publication,1983
2. Mikkel P Groover,''Automation, Production Systems and CIM''Prentice Hall, 1987
3. David J Parrish,''Flexible Manufacturing'' Butterworth Heinemann, 1990.

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I-SEM M.E. APS	Subject Code	Subject Name / Title	Maximum Marks Allotted					Contract Hrs. per weeks			Total Credits
			Theory			Practical					
			End Sem	Mid Sem MST	Quiz + Assignment	End Sem	Lab Work	L	T	P	
	APS-1114	Mechatronics	60	20	10+10	-	-	3	1	-	4

Course Outcomes:
On completion of the course, the students will be able to:

CO1	Understand manufacturing processes, production types, plant layouts, and automation strategies.
CO2	Apply mechatronics systems in product design, measurement, and control applications.
CO3	Analyse sensors and transducers for measuring physical parameters with signal processing or servo mechanisms.
CO4	Apply microprocessors in practical systems like temperature control, stepper motor control, and traffic light systems
CO5	Design mechatronics systems and analyse possible design solutions through case studies.

UNIT-I

Fundamentals of Manufacturing and Automation: Manufacturing industries, Types of production, Function in manufacturing, Organisation and information process in manufacturing, plant layout, Production concept and mathematical model, Automation strategies.

UNIT-II

Mechatronics: Introduction to Mechatronics · systems, Mechatronics in products, Measurement systems, control systems, traditional design and Mechatronics design.

UNIT-III

Sensors and Transducers: Introduction, performance terminology, Displacement position and Proximity, Velocity and Motion, Fluid Pressure, Temperature sensors, light sensors, selection of sensors, signal processing, servo systems

UNIT-IV

Microprocessors in Mechatronics: Introduction, Architecture, PIN configuration, instruction set, Programming of microprocessor using 8085 instructions, Interfacing input and 'output devices,· Interfacing D/A converters and A/D converters, Applications, Temperature. Control, stepper motor controller, traffic light controller.

UNIT-V

Design of Mechatronics: Designing, possible design solutions, case studies of Mechatronics systems.

BOOKS RECOMMENDED

1. Milell P Groover, ''Automation, Production Systems and CIM''.PHI.
2. Zied Ibrahim,''CAD/CAM,Theory and Practice'',McGraw Hills
3. Ramesh Goankad ''Micrpprocessor, Architecture, Programming and Applications'', Wiley East Publication.
4. Ghosh P.K. and Sridhar P.K. ''Introduction to microprocessor for engineers and scientist''.PHI.
5. Lawrence J Kamm, ''Understanding Electromechanically Engineering; An Introduction to Mechatronics'', PHI.

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I-SEM M.E. APS	Subject Code	Subject Name / Title	Maximum Marks Allotted					Contract Hrs. per weeks			Total Credits
			Theory			Practical					
			End Sem	Mid Sem MST	Quiz + Assignment	End Sem	Lab Work	L	T	P	
	APS-1115 (A)	Total Quality Management	60	20	10 + 10	-	-	3	1	-	4

Course Outcomes:
On completion of the course, the students will be able to:

CO1	An understanding of Quality Management, TQM, TQM Gurus, Benchmarking, Reengineering concurrent engineering.
CO2	An understanding of leadership, organization structure, ISO-9000, QS-9000.
CO3	An understanding of techniques of TQM, JIT, QFD, Quality circles, Taguchi methods.
CO4	An understanding of statistical Quality control method for variables and attributes other SPC techniques, Process Capability Analysis and Six Sigma.
CO5	An understanding of Acceptance sampling.

UNIT-I

Introduction: Principles of Quality management, Pioneers of TQM, Quality Cost, Quality Systems, Customer Orientation, Benchmarking, Re Engineering, Concurrent Engineering:

UNIT-II

Practices of TQM: Leadership, organizational structure, team building, information system and documentation, Quality auditing ISO 9000, QS 9000.

UNIT-III

Techniques of TQM: Single vendor concept, JIT, Quality Function Deployment, Quality Circles, KAIZEN, SGA, POKA YOKE, Taguchi Methods.

UNIT-IV

Statistical Quality Control: 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, Six Sigma Accuracy.

UNIT-V

Acceptance Sampling: Acceptance Sampling problems, Single sampling plans for attributes, double, multiple and sequential sampling, military standards, the Dodge-Roming sampling plans.

BOOKS RECOMMENDED

1. Mohammd Zairi, ''Total Quaility Management for Engineers", Woodhead Publishing Limited, 1991
2. Harvid Noori and Russel, ''Productions and Operations Management- Total Quality and Responsiveness'',Mc Graw Hill Inc 1995
3. Suresh Dalela and Sourabh, ''ISO 9000; A maual for Toral Quality Management", S. Chand and Company Ltd, 1995
4. John Ban, ''The Essence of Total Quality Management", Prentice Hall of India Ltd,1995
5. Douglus C. Mohtgomery, "Introduction to Statistical Quality Control". 2nd Edition, John Wiley and Sons, 1991.
6. Grant E.L. and Leavensworth,"Statistical Quality Control", McGraw Hill, 1984.

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I-SEM M.E. APS	Subject Code	Subject Name / Title	Maximum Marks Allotted					Contract Hrs. per weeks			Total Credits
			Theory			Practical					
			End Sem	Mid Sem MST	Quiz + Assignment	End Sem	Lab Work	L	T	P	
	APS-1115 (B)	Design of Cellular Manufacturing	60	20	10+10	-	-	3	1	-	4

Course Outcomes:
On completion of the course, the students will be able to:

CO1	Understand the characteristics, benefits, design and issues of group technology based on limitations of traditional manufacturing systems.
CO2	Solve design problems of cellular manufacturing systems based on different approaches, models, algorithms and neural networks.
CO3	Implement the group technology based on different layouts, models, approaches and life cycle issues.
CO4	Measure the performance of cellular manufacturing systems.
CO5	learn the economics related to cellular manufacturing systems.

UNIT-I

Introduction: Introduction to Group Technology, Limitations of traditional manufacturing systems, characteristics, and design of groups, benefits of GT and issues in GT.

UNIT-II

CMS Planning and Design: Problems in GT/CMS, Design of CMS, Models, traditional approaches and non-traditional approaches, Genetic Algorithms, Simulated Annealing, Neural networks.

UNIT-III

Implementation of GT/CMS: Inter and Intra cell layout, cost and non-cost based models, establishing a team approach, Managerial structure and groups, batch sequencing and sizing; life cycle issues in GT/CMS.

UNIT-IV

Performance Measurement and Control: Measuring CMS performance, parametric analysis, PBC in GT/CMS, cell loading, GT and MRP framework.

UNIT-V

Economics of GT/CMS: Conventional Vs group use of computer models in GT/CMS, Human aspects of GT/CMS, cases.

BOOKS RECOMMENDED

1. Burbidge, J.L."Group Technology in Engineering Industry", Mechanical Engineering Publication.
2. Askin R.G. Vakharia A.J. "GT Planning and Operation,in automated factory" Hand Book.
3. Cleland, D.I. & Bidananda, "Technology and Management", 8/e TAB Books, NY
4. Irani, S.A."Cellular Manufacturing Systems "Hand Book.
5. Kamrani, A.K. Parsai, HR and Liles, D.H (Eds), "planning, design and analysis of cellular manufacturing systems "Elsevier, 1995.

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I-SEM M.E. APS	Subject Code	Subject Name / Title	Maximum Marks Allotted					Contract Hrs. per weeks			Total Credits
			Theory			Practical					
			End Sem	Mid Sem MST	Quiz, Assignment	End Sem	Lab Work	L	T	P	
	APS-1115 (C)	Product Design & Development	60	20	10+10	-	-	3	1	-	4

Course Outcomes:
On completion of the course, the students will be able to:

CO1	Put into practice various steps involved in the design of new product.
CO2	Realize strategies involved in Industrial design.
CO3	Understand the importance of economic factors and apply principles of value engineering to new product development in the product design.
CO4	Understand product development cycle, especially Booz, Allen & Hamilton new product development cycle & ATAR motel in financial analysis.
CO5	To implement principles important from environment conservation point of view in product design.

UNIT-I

Introduction, definition, design by innovation, evolution, essential factors of product design, production consumption cycle (pcc), fow and value addition in pcc, morphology of design, primary phases of design, role of allowances, process capability and tolerances in design and assembly.

UNIT-II

Product design strategies in industry , pricing, quality, utility, luxuriousness, product analysis, simplification, designer and his role, Industrial design considerations, procedures, problems, types of models, role of aesthetics, functional design practices.

UNIT-III

Economic factors influencing design, product value, economic analysis, profit , competitiveness, break even. Value engineering & product design, value, value analysis job plan, creativity, value analysis tests.

UNIT-IV

New product development and product management- defining product by nature and demand, New product strategy, product classification, product development & management, product life cycle, Booz Allen & Hamilton new product development cycle, A T A R model applied to financial analysis in business.

UNIT-V

Product design and development for environment, introduction, importance, factors, scope of impact, global & local issues, guidelines for design, life cycle assessment.

BOOKS RECOMMENDED

1. K. Chitale, R. C. Gupta, "Product Design and Manufacturing" , PHI Publication, 2013 Reference Books:
2. Karl T. Ulrich, Stephen Eppinger, "Product Design and Development", McGraw Hill Publication, 2012

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I-SEM M.E. APS	Subject Code	Subject Name / Title	Maximum Marks Allotted					Contract Hrs. per weeks			Total Credits
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			End Sem	Mid Sem MST	Quiz + Assignment	End Sem	Lab Work	L	T	P	
	APS-1115 (D)	Industry 4.0	60	20	10 + 10	-	-	3	1	-	4

Course Outcomes:
On completion of the course, the students will be able to:

CO1	Characterize different principles and attributes of Industry 4.0
CO2	Suggest the relevant technologies as per the proposed framework and roadmap of Industry 4.0
CO3	Conceptualize different components of Industry 4.0 necessary for cyber physical systems.
CO4	Incorporate the principles of industry 4.0 in industrial robotics and additive manufacturing.
CO5	Justify the opportunities and challenges of Industry 4.0 along with the role of Augmented reality and digital twins in Industry 4.0

UNIT-I

Introduction to Industry 4.0 (I4.0): Introduction, Progress and characteristics of Industrial Revolution, Principles of I4.0, need of I4.0 Revolution, attributes of I4.0, Concept of M2M Communication .

UNIT-II

A Conceptual Framework for Industry 4.0: Introduction, State of Art, Characteristics of Industry 4.0, Supportive Technologies, Proposed Framework for Industry 4.0, Roadmap of I4.0.

UNIT-III

Components of Industry 4.0 (A): Internet of Things (IOT), Industrial Internet of Things (IIOT), Cyber Physical System (CPS), Cyber Security : Introduction, Block Chain Technology.

UNIT-IV

Components of Industry 4.0 (B): Autonomous Robot, Cobots, Cloud Computing, Additive Manufacturing (3-D Printing), Design Prerequisites of Industry 4.0, What I4.0 fix in our business?

UNIT-V

Components of Industry 4.0 (C): The Role of Augmented Reality in the Age of Industry 4.0: Introduction AR Hardware and Software Technology, Industrial Applications of AR, Digital Twin, Opportunities and Challenges of I4.0.

BOOKS RECOMMENDED

1. Alp Ustundag and Emre Cevikcan, "Industry 4.0:Managing the Digital Transformation".
2. Bartodziej, Christoph Jan, " The Concept Industry 4.0".
3. Klaus Schwab, "The Fourth Industrial Revolution".
4. Christain Schroder, " The Challenges of Industry 4.0 for Small and Medium sized Enterprises".