Samrat Ashok Technological Institute (Engineering. College) VIDISHA (M.P.)

(An Autonomous Institute Affiliated to RGPV, Bhopal)

Proposed Scheme of Examination

Third Semester – M.E. in Advance Production System

S. No.	Subject Code	Subject Name / Title	Periods per week			Credits	Maximum Marks (Theory) Slot					Total Marks
			L	T	P		End Sem Marks	Tests (Two)	Assignment/ Quiz	End Sem. Practical/Viva	Practical Record/Assignment/ Quiz/Presentation	
1	APS-1131	Elective (E-IV)	3	1	-	4	60	20	10 + 10	-	-	100
2	APS-1132	Elective (E-V)	3	1	-	4	60	20	10 + 10	-	-	100
3	APS-1133	Seminar	-	-	4	4	-	-	-	-	100	100
4	APS-1134	Pre-dissertation (Literature Review/ Problem Formation/ Synopsis)	-	-	8	8	-	-	-	120	80	200
		Total	-	-	-	-	**140**	**40**	**20**	**120**	**180**	**500**

L: Lecture **T: Tutorial** **P: Practical**

Elective – I V (i) Supply Chain Management **(ii) Tool Engineering & Design** **(iii) Robotics**

Elective – V (i) Operations Management **(ii) Advance Optimization Techniques** **(iii) Micro & Nano Manufacturing**

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III-SEM M.E. APS	Subject Code	Subject Name / Title	Maximum Marks Allotted					Contact Hrs. per weeks			Total Credit
			Theory			Practical					
			End Sem	Mid Sem MST	Quiz Assign ment	End Sem	Lab Work	L	T	P	
	APS-1131 (A)	Supply Chain Management	60	20	10 + 10	-	-	3	1	-	4

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

CO1	Understand the basics of supply chain management and logistics.
CO2	Learn the concepts of modular company, network relations, procurement process.
CO3	Understand different models of supply chain, strategy, management and redesign of supply chain.
CO4	Learn the structuring of supply chain, its functional roles, design frame-work.
CO5	Incorporate the information systems in the supply chain management.

UNIT-I

Introduction: Logistics, Concepts, Definitions, approaches, factors affecting logistics. Supply chain, basic tasks of the supply chain, the new corporate model.

UNIT-II

Supply Chain Management: The new paradigm, the modular company, the network relations, supply process, Procurement process, Distribution management.

UNIT-III

Evolution of Supply Chain Models: Strategy and structure, factors of supply chain, Manufacturing strategy stages, supply chain progress, model for competing through· supply chain management, PLC grid, supply chain redesign, Linking supply chain with customer.

UNIT-IV

Supply Chain Activity Systems: Structuring the SC, SC and new product, functional roles in SC, SC design frame-work, collaborative product commerce (CPC).

UNIT-V

SCM Organization and Information System: The management task, logistics organization, the logistics information S)':Stems, Topology of SC application, MRP, ERP, Warehouse management system, product data management, cases.

BOOKS RECOMMENDED

1. Scharj, P.B. Lasen, TS, "Managing the global supply chain", Viva books, New Delhi
2. Ayers, J.B. "Hand book of supply chain management", The St. Lencie press, 2000.
3. Nicolas, J.N. "Competitive manufacturing management-continuous improvement", Lean production, and customer focused quality, McGraw-Hill, NY, 1998.
4. Steudel, IIJ: and Desruelle, P, "Manufacturing in the ninetees-How to become a mean, lean and world class competitor", Van Nostrand Reinhold: NY, 1992.

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			Theory			Practical					
			End Sem	Mid Sem MST	Quiz Assign ment	End Sem	Lab Work	L	T	P	
	APS-1131 (B)	Tool Engineering & Design	60	20	10 + 10	-	-	3	1	-	4

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

CO1	Conceptualize the role of tool engineering for manufacturing processes.
CO2	Design the tooling for traditional and non-traditional machining processes.
CO3	Design the tooling for forming process.
CO4	Design the tooling for casting and joining processes.
CO5	Design the tooling for inspection and gauging.

UNIT-I
Introduction to manufacturing processes, objectives, organization and role of tool engineering, role of materials in tooling

UNIT-II
Tooling for material removal process like traditional machining processes, nontraditional machining processes automats and NC and CNC machines.

UNIT-III
Tooling for forming processes.

UNIT-IV
Tooling for casting and metal joining processes, molding and pattern design mechanization of foundries Design of welding fixtures, tooling for mechanical joining processes.

UNIT-V
Tooling for inspection and gauging, design and manufacturing of gauges, CMM, CAD in tool design.

BOOKS RECOMMENDED

1. Hoffman E.G."Fundamentals of tool design", SME, 1984.
2. Kalpakjian S. "Manufacturing Engineering and Technology", Addision Wesley, 1995
3. HMT "Production Technology", Tata McGraw Hill, 1991

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III-SEM M.E. APS	Subject Code	Subject Name / Title	Maximum Marks Allotted					Contact Hrs. per weeks			Total Credit
			Theory			Practical					
			End Sem	Mid Sem MST	Quiz Assign ment	End Sem	Lab Work	L	T	P	
	APS-1131 (C)	Robotics	60	20	10 + 10	-	-	3	1	-	4

Course Outcomes:

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

CO1	Conceptualize the basics of robotics through the classification of grippers, manipulators and sensors.
CO2	Apply the principles of kinematics and dynamics to robotic manipulators through the principles of matrices, Lagrangian formulations and Newton Euler formulation.
CO3	Apply the principles of mechanics for trajectory planning of robotic manipulator and its further control.
CO4	Learn the basics of robot programming.
CO5	Justify different engineering applications of robots.

UNIT-I

Introduction: Robotics-classification, Sensors-Position sensors, Velocity sensors, Proximity sensors, Touch and Slip Sensors, Force and Torque sensors. Grippers and Manipulators-Gripper joints, Gripper force, Serial manipulator, Parallel Manipulator, selection of Robot-Selection based on the Application

UNIT-II

Kinematics: Manipulators Kinematics, Rotation Matrix, Homogenous Transformation Matrix, Direct and Inverse Kinematics for industrial robots for Position and orientation.

Statics & dynamics: Differential Kinematics and static- Dynamics-Lagrangian Formulation, Newton Euler Formulation for RR & RP Manipulators,

UNIT-III

Trajectory planning: Motion Control- Interaction control, Rigid Body mechanics.

Control: architecture- position, path velocity and force control systems, computed torque control, Adaptive control, and Servo system for robot control.

UNIT-IV

Robot programming: Programming of Robots and Vision System- overview of various programming Languages.

UNIT-V

Applications: Application of Robots in production systems- Application of robot in welding, machine tools, material handling, and assembly operations parts sorting and parts inspection.

BOOKS RECOMMENDED

1. Craig, J.J., *Introduction to Robotics Mechanics and Control*, Addison Wesley, 1999.
2. Saha, Subir Kumar. Introduction to robotics. Tata McGraw-Hill Education, 2014.
3. Spong, Mark W., Seth Hutchinson, and Mathukumalli Vidyasagar. Robot modeling and control. Vol. 3. New York: Wiley, 2006.

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			Theory			Practical					
			End Sem	Mid Sem MST	Quiz Assign ment	End Sem	Lab Work	L	T	P	
	APS-1132 (A)	Operations Management	60	20	10 + 10	-	-	3	1	-	4

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

CO1	Learn the basic concepts of production system design, product design, product standardization, production and operations functions, concurrent engineering and the associated merits and limitations.
CO2	Understand the basics of production planning and control.
CO3	Suggest the facility location and layout for the plant including inventory.
CO4	Learn about production system management through JIT, SCM and BPR.
CO5	Perform quality analysis through statistical techniques and principles of quality management.

UNIT-I

Production system design and control, Types of production system, Production & Operation functions. Product design and development, product standardization · and simplification, concurrent engineering implementation, advantages and limitations.

UNIT-II

Production planning and control, Capacity requirement planning, Material requirement planning, production routing, Scheduling, Dispatching, Process planning, Computer Aided Process Planning (CAPP), ERP.

UNIT-III

Facility location and layout; Factor affecting layout selection and analysis inventory control and its function, Purchasing principle and procedures, storage procedures, stock verification.

UNIT-IV

Production system, management: Just-in-time (JIT), supply chain management, Business process re-engineering (BPR), Lean Manufacturing.

UNIT-V

Quality management: Techniques of statistical Quality· control, Inspection and sampling, Total quality management, Principles, Aims and objectives of Personnel management.

BOOKS RECOMMENDED

1. Krishnamurthy, "Production and Operation Management" PHI
2. Adam & Ebert, P.O.M./P.H.I.
3. K.C. Jain, "Production Planning and Control "Khanna.

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			Theory			Practical					
			End Sem	Mid Sem MST	Quiz Assign ment	End Sem	Lab Work	L	T	P	
	APS-1132 (B)	Advanced Optimization Techniques	60	20	10 + 10	-	-	3	1	-	4

Course Outcomes:

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

CO1	Learn the basic concepts of optimization through classification of optimization problems.
CO2	Apply basic constrained and unconstrained optimization techniques along with programming methods.
CO3	Apply the methods of integer linear and integer non-linear programming.
CO4	Apply multi-objective optimization method, separable programming and stochastic programming.
CO5	Incorporate the principles genetic algorithms and neural networks in optimization.

UNIT-I

Introduction, Classification of optimization problems, Applications of optimization, concepts of design vector, Design constraints, constrain surface, objective function surfaces and multilevel optimization.

UNIT-II

Karmakar's method of solving L.P. problems, Quadratic programming, nonlinear programming, unconstrained optimization techniques, Basics of constrained optimization.

UNIT-III

Integer linear programming methods and applications, Introduction to integer non-linear programming, Basics of geometric programming

UNIT-IV

Multi-objective . optimization methods and applications, Formulation of problems, Separable programming and-stochastic programming

UNIT-V

Introduction to Genetic algorithms, Simulated Annealing, neural network based optimization and optimization of fuzzy systems.

BOOKS RECOMMENDED

1. Kalyanmoy Deb, "Optimization for Engineering design- algorithms and examples" PHI, New Delhi, 1995.
2. Singiresu S. Rao. "Engineering optimization' – Theory and practices", John Weley and Sons, 1998.
3. Garfinkel, R.S. and Nemhauser, G.L. "Integer programming", Jonh Wiley & Sons, 1972.

III-SEM M.E. APS	Subject Code	Subject Name / Title	Maximum Marks Allotted					Contact Hrs. per weeks			Total Credit
			Theory			Practical					
			End Sem	Mid Sem MST	Quiz Assign ment	End Sem	Lab Work	L	T	P	
	APS-1132 (C)	Micro & Nano Manufacturing	60	20	10 + 10	-	-	3	1	-	4

Course Outcomes:

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

CO1	Learn the basic concepts of nanotechnology, its approaches and associated challenges.
CO2	Understand the different methods of nano-materials synthesis and processing.
CO3	Conceptualize the different material characterization techniques.
CO4	Learn about different micro-fabrication techniques.
CO5	Learn about the different MEMS devices and their applications.

UNIT I:

Introduction: Importance of Nano-technology, Emergence of Nanotechnology, Bottom-up and Top-down approaches, challenges in Nanotechnology.

UNIT II:

Nano materials Synthesis and Processing: Methods for creating Nanostructures; Processes for producing ultra-fine powders - Mechanical grinding; Wet Chemical Synthesis of nanomaterials - sol-gel process, Liquid solid reactions; Gas Phase synthesis of nanomaterials- Furnace, Flame assisted ultrasonic spray pyrolysis; Gas Condensation Processing GPC), Chemical Vapour Condensation (CVC)- Cold Plasma Methods, Laser ablation, Vapour - liquid -solid growth, particle precipitation aided CVD, summary of Gas Condensation Processing (GPC).

UNIT III:

Structural Characterization: X-ray diffraction, Small angle X-ray Scattering, Optical Microscope and their description, Scanning Electron Microscopy (SEM), Scanning Probe Microscopy (SPM), TEM and EDAX analysis, Scanning Tunneling Microscopy (STM), Atomic force Microscopy (AFM).

UNIT IV:

Micro fabrication Techniques: Lithography, Thin Film Deposition and Doping, Etching and Substrate Removal, Substrate Bonding. MEMS Fabrication Techniques, Bulk Micromachining: Processes used for shaping and sizing of microproducts and macro products and Nano finishing techniques , Surface Micromachining, High- Aspect-Ratio Micromachining.

UNIT V:

MEMS devices and applications: Pressure sensor, inertial sensor, Optical MEMS and RFMEMS, Micro-actuators for dual-stage servo systems.

BOOKS RECOMMENDED

1.Tai-Ran Hsu, "MEMS and Microsystems: Design and Manufacture," McGraw- Hill, 2008.
2. V. K. Jain, "Introduction to Micromachining", 2nd Edition, Alpha Science, 2014.
3. Mark James Jackson, "Microfabrication and Nanomanufacturing", CRC Press, 2005.
4. Gabor L. Hornyak, H.F.Tibbals, Joydeep Dutta & John J Moore, "Introduction to Nanoscience and Nanotechnology", CRC Press, 2009.
5. Ray F. Edgerton, "Physical Principles of Electron Microscopy: An Introduction toTEM, SEM, and AEM", Springer, 2005.
6. B.D. Cullity, "Elements of X-Ray Diffraction", 3 rd Edition, Prentice Hall, 2002.