KLE Technological University
Creating Value, Leveraging Knowledge

Curriculum Structure and Curriculum Content for the Academic Batch 2025-27
School /Department: Mechanical Engineering
Program: M.Tech in Advanced Manufacturing Systems

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KLE Technological University | Creating Value, Leveraging Knowledge

Vision and Mission of KLE Technological University

Vision

KLE Technological University will be a national leader in Higher Education– recognised globally for innovative culture, outstanding student experience, research excellence and social impact.

Mission

KLE Technological University is dedicated to teaching that meets highest standards of excellence, generation and application of new knowledge through research and creative endeavours.

The three-fold mission of the University is:

- To offer undergraduate and post-graduate programs with engaged and experiential learning environment enriched by high quality instruction that prepares students to succeed in their lives and professional careers.

- To enable and grow disciplinary and inter-disciplinary areas of research that build on present strengths and future opportunities aligning with areas of national strategic importance and priority.

- To actively engage in the Socio-economic development of the region by contributing our expertise, experience and leadership, to enhance competitiveness and quality of life.

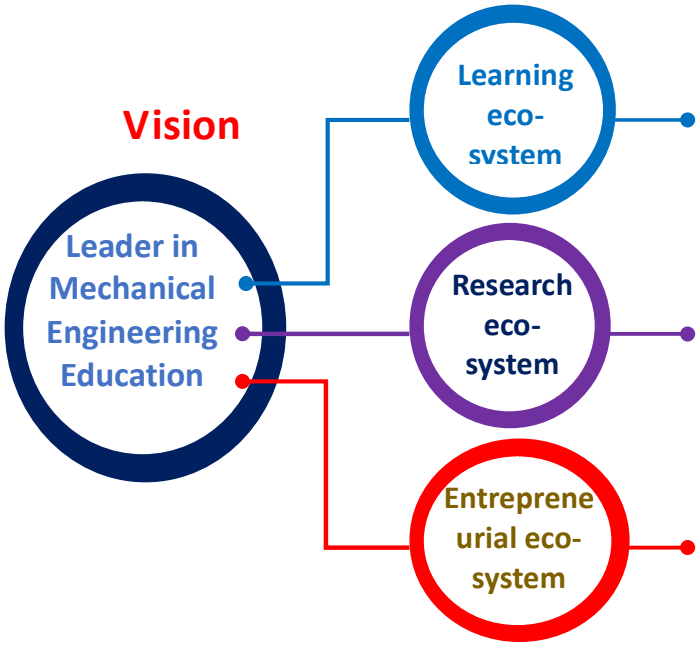
As a unified community of faculty, staff and students, we work together with the spirit of collaboration and partnership to accomplish our mission.

Vision and Mission Statements of the School / Department

Vision

KLE Tech - School of Mechanical Engineering will be a national leader in mechanical engineering education - recognized for innovative culture, outstanding research and societal outreach.

Mission



Offer programs in an **engaging and experiential learning environment**, preparing students for success in their lives and professional careers.

Engage in Mechanical-discipline and inter-disciplinary research aligned to areas of national importance and priority.

Contribute to **socio-economic development** of the region for enhanced quality of life.

Program Educational Objectives/Program Outcomes and Program-Specific Objectives

Program Educational Objectives -PEOs
1. Graduates will demonstrate technical competence in design of products, processes and systems to address identified problems through focused research directed by guiding principles of technical documentation and evaluation with due consideration to sustainability principles incorporating modern computing tools.
2. Graduates will be competent as leaders committed to strive towards attainment of professional and organizational goals with due adherence to professional ethics team expectations and sensitivities of cultural diversity.
3. Graduates will practice of engineering profession in corporate and governmental settings to meet prevailing stake holder needs, thereby contributing to societal development.
4. Graduates will get updated to actively adopt new professional development through suitable application of domain knowledge and compete for new career openings evolving in the ever-changing global enterprises.
Program Outcomes-POs
1. An ability to independently carry out research /investigation and development work to solve practical problems
2. An ability to write and present a substantial technical report/document
3. Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

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Curriculum Structure-Overall

	Semester 1 to 4 (2025-27)			**Total Program Credits:88**
Course with course code	**I**	**II**	**III**	**IV**
	Product Lifecycle Management	Advanced Technologies in PLM	Industrial Training/Mini Project	Project Work Phase II
	Engineering Data Management	ERP System Implementation and Management	Project Work Phase I	
	Product Design and Development	Project Feasibility and Analysis		
	Enterprise Resource Planning	Research Methodology		
	Programme Elective I	Programme Elective II		
	Collaborative Design-Modelling Lab	PLM Advanced Lab		
	PLM Functional Lab	ERP Advanced Lab		
	ERP Functional Lab	Mini Project		
		Advanced Technologies in PLM		
Credits	**25**	**25**	**18**	**20**

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Curriculum Structure-Semester wise

Semester – I

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No	Code	Course	Category	L-T-P	Credits	Contact Hours	ISA	ESA	Total	Exam Duration (in hrs)
1	25EAMC701	Product Lifecycle Management	PC	3-1-0	4	05	50	50	100	3 hours
2	25EAMC702	Engineering Data Management	PC	3-0-0	3	03	50	50	100	3 hours
3	25EAMC703	Product Design and Development	PC	3-0-0	3	03	50	50	100	3 hours
4	25EAMC704	Enterprise Resource Planning	PC	3-0-0	3	03	50	50	100	3 hours
5	25EAMEXXX	Programme Elective I	PE	3-0-0	3	03	50	50	100	3 hours
6	25EAMP701	Collaborative Design-Modelling Lab	PC	0-0-3	3	06	80	20	100	2 hours
7	25EAMP702	PLM Functional Lab	PC	0-0-3	3	06	80	20	100	2 hours
8	25EAMP703	ERP Functional Lab	PC	0-0-3	3	06	80	20	100	2 hours
TOTAL				**15-1-9**	**25**	**35**				

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Semester – II

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No	Code	Course	Category	L-T-P	Credits	Contact Hours	ISA	ESA	Total	Exam Duration (in hrs)
1	25EAMC705	Advanced Technologies in PLM	PC	3-1-0	4	05	50	50	100	3 hours
2	25EAMC706	ERP System Implementation and Management	PC	3-0-0	3	03	50	50	100	3 hours
3	25EAMC707	Project Feasibility and Analysis	PC	3-0-0	3	03	50	50	100	3 hours
4	20EAMC708	Research Methodology	PC	2-1-0	3	04	100	-	100	-
5	25EAMEXXX	Programme Elective II	PE	3-0-0	3	03	50	50	100	3 hours
6	25EAMP704	PLM Advanced Lab	PC	0-0-3	3	06	80	20	100	2 hours
7	25EAMP705	ERP Advanced Lab	PC	0-0-3	3	06	80	20	100	2 hours
9	20EAMW701	Mini Project	PC	0-0-3	3	06	50	50	100	2 hours
TOTAL				**14-2-9**	**25**	**36**				

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Semester- III

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No	Code	Course	Category	L-T-P	Credits	Contact Hours	ISA	ESA	Total	Exam Duration (in hrs)
1	20EAMI801	Industrial Training/Mini Project	PJ	0-0-10	10	30	50	50	100	2 hours
2	20EAMW801	Project Work Phase I	PJ	0-0-8	8	24	50	50	100	2 hours
TOTAL				**0-0-18**	**18**	**54**				

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Semester- IV

No	Code	Course	Category	L-T-P	Credits	Contact Hours	ISA	ESA	Total	Exam Duration (in hrs)
1	20EAMW802	Project Work Phase II	PJ	0-0-20	20	40	50	50	100	2 hours
TOTAL				**0-0-20**	**20**	**40**				

List of Program Electives

←Back-1Semester

Sr.No	Name of the Course	Course Code
1	Design for Additive Manufacturing	25EAME701
2	Industrial Robotics	25EAME702
3	Supply Chain Management	25EAME703
4	Manufacturing Systems Simulation	25EAME704
5	Additive Manufacturing	25EAME705
6	Manufacturing Systems and Automation	25EAME706
7	Manufacturing Execution Systems	25EAME707
8	Robust Design Optimization	25EAME708

Program: Advanced Manufacturing Systems		**Semester: I**
Course Title: Engineering Data Management		**Course Code:** 25EAMC702
L-T-P: 3-0-0	**Credits: 3**	**Contact Hours: 3 Hrs/week**
ISA Marks: 50	**ESA Marks: 50**	**Total Marks: 100**
Teaching Hours: 40	**Examination Duration: 3 Hrs**	

Unit I

Chapter 1. Introduction and Overview of Embedded Product Design: 8 hrs

Background, related research and research problems, structure of the report, design for manufacture, design of embedded products, technical design disciplines and document management, software design, electronics design, software-hardware co-design, mechanical design, concurrent engineering, design data management.

Chapter 2. PDM Systems and Data Exchange: 7 hrs

Product data management (PDM), state-of-the-art trends of PDM, data formats and translators in data exchange, step (standard for the exchange of product model data), CDIF (case data interchange format), SGML (standard generalized mark-up language).

Unit II

Chapter 3. PDM and SCM: 8 hrs

PDM and the product life cycle, PDM systems – common functionality, product structure and document management, system architecture, version management, configuration selection, concurrent development, build management, release management, workspace management, change management.

Chapter 4. PDM and SCM Requirements of Design Data Management: 7 hrs

Requirements for the embedded product's design data management, data management, process and life-cycle management, data capture & distribution, support for working methods, requirements for enterprise-level design data management, design data management levels, the design data management features of design tools , team-level design data management, team-level design data management.

Unit III

Chapter 5. Analysis of Needs and Solutions of Product Data in PLM Environment: 10 hrs

Comparison of principles, comparison of key functionalities, requirements and needs, analysis, different scenarios in an integrated environment, possible integrations, examples of integrations. Relevance of product data in PLM, product data across the lifecycle, tools to represent product data, data model diagrams, reality in a typical company-issues, challenges and objectives, product data activities in the PLM initiative-product data improvement.

Reference Books:

1. JukkaKaariainen, PekkaSavolainen, JormaTaramaa& Kari Leppala, Product Data Management (PDM) Design, exchange and integration viewpoints, VTT- Technical research centre of Finland, 2000.
2. Rodger Burden PDM: Product Data Management Volume 1, Resource Publishing, 2003.

Program: Advanced Manufacturing Systems		**Semester: I**
Course Title: Product Lifecycle Management		**Course Code:** 25EAMC701
L-T-P: 3-1-0	**Credits: 4**	**Contact Hours: 5 Hrs/week**
ISA Marks: 50	**ESA Marks: 50**	**Total Marks: 100**
Teaching Hours: 40	**Examination Duration: 3 Hrs**	

Unit I

Chapter 1. The PLM Environment: 8 hrs

PLM overview, background for PLM, scope, PLM grid, PLMparadigm – concepts and consequences, strategic benefits, operational benefits, spread of PLM, overcoming problems, enabling opportunities, challenges, issues in the traditional environment, product data issues, a complex changing environment.

Chapter 2. PLM: A Key Enabler in Implementation of Industry 4.0: 7 hrs

Digital manufacturing, industry 4.0 – a smart era, action areas of industry 4.0, PLM in industry 4.0, collaborations in industry 4.0 via PLM, ip protection and bom management in industry 4.0 via PLM, project and variant management in industry 4.0 via PLM, traceability requirements management in industry 4.0 via PLM, benefits of incorporating PLM in industry 4.0, challenges and future directions for PLM in industry 4.0.

Unit II

Chapter 3. Organizational Change Management:8 hrs

Relevance of OCM inPLM, benefits of OCM, incremental and transformational change, prerequisites for change management, the importance of OCM in the PLM environment, participants in change, generic issues with change, OCM activities in the PLM environment, pitfalls of organizational change.

Chapter 4. Project Management in PLM Environment:7 hrs

Characteristics of projects, people in projects, project phases, project management knowledge area, project management tools and templates, the importance of project management in PLM, project reality in a typical company, project management activities in PLM initiatives, pitfalls of project management, top management role with project management.

Unit III

Chapter 5. Business Process and Information System in PLM Environment: 10 hrs

Relevance of business processes in PLM, process approach, tools to represent business processes, generic issues and challenges, business process activities in the PLM initiative, PLM applications in the product lifecycle, the PDM system, KPIs for PLM applications, applications activities in the PLM initiatives.

Reference Books:

1. Stark John, "Product Lifecycle Management: 21st Century Paradigm for Product Realization", Springer, Third Edition, 2015
2. ChaudheryMustansar Hussain & Paolo Di Sia, "Handbook of Smart Materials, Technologies, and Devices: Applications of Industry 4.0", Springer. First Edition, 2021Ross P. J., "Taguchi Techniques for Quality Engineering", McGraw -Hill International.

Curriculum Content- Course wise

←Back-1Semester

Program: Advanced Manufacturing Systems		**Semester: I**
Course Title: Product Design & Development		**Course Code:** 25EAMC703
L-T-P: 3-0-0	**Credits: 3**	**Contact Hours: 3 Hrs/week**
ISA Marks: 50	**ESA Marks: 50**	**Total Marks: 100**
Teaching Hours: 40	**Examination Duration: 3 Hrs**	

Unit I

Chapter 1. Principles of Product Design: 08 hrs

Characteristics of successful product development, duration and cost of product development, challenges of product development.

Chapter 2. Design Strategy and Customer Focus: 08 hrs

Generic development process, concept development – front-end process, adapting the generic product development process, defining scope, gathering data from customers, establishing relative importance of needs.

Unit II

Chapter 3. Setting Design Targets and Generating Concepts: 08 hrs

Target specifications, refining specifications, five-step methodology of concept generation.

Chapter 4. Concept Evaluation and Aesthetic Design: 08 hrs

Structured methodology for selecting a concept using selection matrix and ranking of concepts, meaning and implication of product architecture, meaning of industrial design, impact of industrial design, aesthetic and ergonomic considerations, industrial design process.

Unit III

Chapter 5. Manufacturing and Quality in Product Design: 08 hrs

DFM meaning, DFM methodology, definition of value, value analysis job plan, creativity techniques, concurrent design, QFD, house of quality.

Reference Books:

1. JukkaKaariainen, PekkaSavolainen, JormaTaramaa& Kari Leppala, Product Data Management (PDM) Design, exchange and integration viewpoints, VTT- Technical research centre of Finland, 2000.
2. Rodger Burden PDM: Product Data Management Volume 1, Resource Publishing, 2003.

Curriculum Content- Course wise

←Back-1Semester

Program: Advanced Manufacturing Systems		**Semester: I**
Course Title: Enterprise Resource Planning		**Course Code:** 25EAMC704
L-T-P: 3-0-0	**Credits: 3**	**Contact Hours: 3 Hrs/week**
ISA Marks: 50	**ESA Marks: 50**	**Total Marks: 100**
Teaching Hours: 40	**Examination Duration: 3 Hrs**	

Unit I

Chapter 1. Introduction to ERP: 4 hrs

Need for ERP, characteristics and components of ERP, suppliers of ERP, integrated management information, seamless integration and functional information system, marketing, accounting and financial management, supply chain management, resource management, integrated data model.

Chapter 2. Business Functions and Business Processes: 11 hrs

Functional areas of operation, business processes, a process view of business, functional areas and business process of very small business. Marketing and sales, supply chain management, accounting and finance, human resources, functional area information system.

need for reengineering, reengineering model, BPR guiding principles, business process reengineering and performance improvement, enablers of BPR in manufacturing, collaborative manufacturing, intelligent manufacturing, production planning. BPR implementation.

Unit II

Chapter 3. Role of ERP in Logistics: 8 hrs

Features of purchase module, ERP purchase system; role of ERP in sales and distribution, sub-modules of the sales and distribution module: master data management, order management, warehouse management, shipping and transportation, billing and sales support, foreign trade, integration of sales and distribution module with other modules.

Chapter 4. Inventory Management: 7 hrs

ERP inventory management system, importance of web ERP in inventory management, ERP inventory management module and sub-modules of the ERP inventory management module, bill of material, safety stock, lot number/batch number, inventory valuation methods.

Unit III

Chapter 5. Production and Supply Chain Management Information Systems: 10 hrs

Product structure and bill of materials (BOM), MRP concept, lot sizing in MRP, capacity requirement planning, MRP-II, MRP exercises. role of ERP in CAD/CAM, MRP, closed loop MRP, MRP-II, manufacturing and production planning module of an ERP system, distribution requirements planning (DRP); ERP approach to production planning, MRP to ERP**.**

Reference Books:

1. Ellen Monk & Bret Wagner, Concepts in Enterprise Resource Planning, 4th edition, Course Technology CENGAGE Learning.
2. Alexis Leon, Enterprise Resource Planning, 3rd edition, Mcgraw Higher Ed.
3. Vinod Kumar Garg, N.K. Venkitakrishnan, Enterprise Resource Planning: Concepts and Practice, 2nd edition, Prentice Hall India Learning Private Limited.
4. Pauline Weetman, Financial and Management Accounting: An Introduction, Pearson Education Limited.

Curriculum Content- Course wise

←Back-1Semester

Program: Master of Technology		
Course Title: Design for Additive Manufacturing		**Course Code: 25EAME701**
L-T-P: 3-0-0	**Credits: 3**	**Contact Hours: 3 hrs/week**
ISA Marks: 50	**ESA Marks: 50**	**Total Marks: 100**
Teaching Hours: 40	**Examination Duration: 3 hrs**	

Chapter 1. Overview of Design for Additive Manufacturing (AM): 04 Hrs

How to design for AM? Challenges & opportunities, Design process, mechanical properties, performance of materials used in AM, process driven & designer driven shape, methods, Additive manufacturing principles & processes.

Chapter 2. Drivers for AM: 06 Hrs

Material efficiency, flow optimization, integration of functions, mass customization, lead time, automated manufacturing, Limitations, Available material, accuracy of the technology, price of the industrial machines, certification of materials and processes, surface finish(supports, post processing), part dimensions.

Chapter 3. DFMA Principles for AM: 10 Hrs

Maximum Part size, Faces requiring support, minimum wall thickness & rigidity, Minimum feature size & manufacturing quality, Typical geometries, DFX rules for additive manufacturing. Cost considerations.

Chapter 4. Topology Optimization for AM: 10 Hrs

Introduction to topology optimization, Topology optimization process, characteristics, link with AM potentials & Challenges, Current developments.

Chapter 5. Accuracy Issues in AM: 10 Hrs

Properties of metallic and nonmetallic additive manufactured surfaces, Stress induced in additive manufacturing (AM) processes. Surface roughness problem in rapid prototyping, Part deposition orientation and issues like accuracy, surface finish, build time, support structure, cost etc.

Text Books

Reference Books:

1. Ian Gibson, David W. Rosen, Brent Stucker, Additive manufacturing technologies: rapid prototyping to direct digital manufacturing, Springer, 2010.
2. Andreas Gebhardt, Understanding additive manufacturing: rapid prototyping, rapid tooling, rapid manufacturing, Hanser Publishers, 2011.
3. Christoph Klahn, Bastian Leutenecker, MirkoMeboldt, Design for Additive Manufacturing – Supporting the Substitution of Components in Series Products, Procedia CIRP 21 2014, 24th CIRP design conference
4. Rosen, D.W., 2007. Design for additive manufacturing: A method to explore unexplored regions of the design space. In Proceedings of the 18th Annual Solid Freeform Fabrication Symposium.

Curriculum Content- Course wise

←Back-1Semester

Program: Master of Technology		
Course Title: Industrial Robotics		**Course Code: 25EAME702**
L-T-P: 3-0-0	**Credits: 3**	**Contact Hours: 3 hrs/week**
ISA Marks: 50	**ESA Marks: 50**	**Total Marks: 100**
Teaching Hours: 40	**Examination Duration: 3 hrs**	

Chapter 1. Robot fundamentals: 04 Hrs

History of robotics, Advantages & Applications of robots, Robot characteristics. Classification and structure of robotic systems, PTP and continuous path systems, JIRA and RIA, Robot components, Robot anatomy (configurations, Robot motions), Work volume, drive systems

Chapter 2. Robot kinematics: 08 Hrs

Matrix representation, Homogeneous transformation matrices, Representation of transformations, Inverse transformation matrices, forward and inverse kinematics of robots, D-H representation of forward kinematic equations, degeneracy and dexterity

Chapter 3. Differential motions and velocities: 06 Hrs

Differential relationships, Jocobian, differential motions of a frame, calculation of Jacobian, inverse jacobian

Chapter 4. Dynamic Analysis and forces: 06 Hrs

Langrangian mechanics, Effective moments of inertia, Dynamic equations of multiple DOF robots, Static force analysis, Transformation of forces and moments between coordinate frames

Chapter 5. Robot control systems: 08 Hrs

Components, Basic control system concepts and models, Controllers, control system analysis, robot actuation and feedback components

Actuators and Sensors: Characteristics of actuating systems, different types of actuators, sensor characteristics, different types of sensors

Chapter 6. Robot Programming: 08 Hrs

Methods (lead through, textual language), program as a path in space, speed control, motion interpolation, wait, signal and delay, branching, capability and limitations of lead through methods

Text Books

Reference Books:

1. KorenYoram, Robotics for Engineers, 2, McGraw-Hill Publication. , 2013
2. Groover M.P, Industrial Robotics, 3, Tata McGraw-Hill Publication, 2013
3. Niku Saeed B, Introduction to Robotics, 4, Prantice Hall India Publication, 2014

Curriculum Content- Course wise

←Back-1Semester

Program: Advanced Manufacturing Systems		**Semester: I**
Course Title: Supply Chain Management		**Course Code:** 25EAME703
L-T-P: 4-0-0	**Credits: 3**	**Contact Hours: 3 Hrs/week**
ISA Marks: 50	**ESA Marks: 50**	**Total Marks: 100**
Teaching Hours: 40	**Examination Duration: 3 Hrs**	

Unit I

Chapter 1. Supply Chain Concepts: 8 hrs

Introduction to supply chain, SCOR model, virtual/extended enterprise, delivery channel, objective of a supply chain, decision phases in a supply chain, production approaches, supply chain process, push & pull production systems, push-pull boundary, lack of coordination and bullwhip effect, order management, order-to-cash process, procure-to-pay process, call-off, replenishment, sourcing.

Chapter 2. Supply Chain Performance and Designing Distribution Networks: 12 hrs

Supply chain strategies, value chain, capabilities, uncertainties, responsiveness vs cost, supply chain performance drivers – facilities, inventory, transportation, information, sourcing, and pricing, supply chain visibility, resilience, non-financial metrics examples, financial metrics examples, sustainability, factors influencing distribution network design, design options for a distribution network, distribution network for online sales, impact of online sales on cost.

Unit II

Chapter 3. Network Design and Demand Management: 10 hrs

Factors influencing network design decisions, framework for network design decisions, facility location mathematical models, capacity allocation mathematical models, network behavior, types of supply relationship, factors influencing nature of network relationship, vertical integration.

Chapter 4. Inventory and Logistics Management: 10 hrs

Cycle inventory, cycle inventory related costs, economics of scales, economic order quantity, multichannel cycle inventory, uncertainty and safety inventory, safety inventory level, transportation in supply chain, modes of transportation, transportation network, trade-offs in transportation design, warehouse layout and design, warehouse types, warehouse operating processes, warehouse management system, procurement, material classification, material codification.

Unit III

Chapter 5. Forecasting and Trends in SCM: 10 hrs

House of SCM, managing demand, managing supply, transportation model, just-in-time in supply chain, forecasting in supply chain, characteristics of forecasts, approaches to demand forecasting Gartner's hype cycle, Capgemini's consulting hype cycle, trend categories, algorithmic supply chain planning, predictive analytics, global logistics visibility, focus on risk management and supply chain resiliency.

Reference Books:

1. Sunil Chopra, and Peter Meindl, "Supply Chain Management – Strategy, Planning, and Operation," Pearson Education.
2. Lora Cecere, "Supply Chain Metrics that Matter," Wiley.
3. HartmutStadtler, "Supply Chain Management and Advanced Planning – Basics, Overview and Challenges," European Journal of Operations Research, 163, 2015.

Curriculum Content- Course wise

←Back-1Semester

Program: Master of Technology		
Course Title: Manufacturing Systems Simulation		**Course Code: 25EAME704**
L-T-P: 3-0-0	**Credits: 3**	**Contact Hours: 3 hrs/week**
ISA Marks: 50	**ESA Marks: 50**	**Total Marks: 100**
Teaching Hours: 40	**Examination Duration: 3 hrs**	

Chapter 1. Simulation Modeling and Analysis: 06 Hrs

Simulation Modeling and Analysis, Other types of simulation models, purpose of simulation, Advantages and Disadvantages of simulation, Limitations of simulation, Other considerations.

Chapter 2. Principles of Modeling& Simulation: 08 Hrs

Basic simulation modeling systems – discrete and continuous systems, general systems theory, models of systems- variety of modeling approach, Simulation as a decision making tool, Principle of computer modeling- Monte Carlo simulation, Nature of computer modeling.

Chapter 3. Problem Formulation and Project Planning: 06 Hrs

Formal problem statement, Orientation, Project objectives, Decision making tools for determining project objectives. Simulation in project management, Simulation project managers function, Developing the simulation project plan, Compressing projects, Advanced project management concepts.

Chapter 4. System Definition, Input Data Collection and Analysis: 08 Hrs

Systems classification, High level flow chart basics, Components and events to model, Data to be included in the model, Output data. Sources of input data, Collecting input data, Deterministic versus Probabilistic data, Discrete vs. Continuous data, Common input data distributions, Analyzing input data.

Chapter 5. Model Translation, Verification and Analysis: 06 Hrs

Simulation program selection, Model translation section, Program organization, Divide-and-Conquer approach, Advancing the simulation clock event by event, Need for validation, Two types of validation, Validation data analysis process.

Chapter 6. Simulation Application Areas: 06 Hrs

Manufacturing and material handling system, Automobile industry, Logistics and transportation systems, Health care, Service systems, Military.

Text Books

Reference Books:

1. Jerry Banks and John S Carson, Barry L Nelson, David M Nicol, Discrete event system simulation, Prentice Hall, India.
2. Ronald G Askin and Charles R Standridge, Modeling and analysis of manufacturing systems, John Wiley & Sons.
3. Gordon G, System Simulation, Prentice Hall, India...
4. Shannon, R.E., System Simulation – The art and science, Prentice Hall, India.
5. Averill Law & David M.Kelton, Simulation, Modeling and Analysis, TMH.

Curriculum Content- Course wise

←Back-1Semester

Program: Master of Technology		
Course Title: Manufacturing Systems & Automation		**Course Code: 25EAME706**
L-T-P: 3-0-0	**Credits: 3**	**Contact Hours: 3 hrs/week**
ISA Marks: 50	**ESA Marks: 50**	**Total Marks: 100**
Teaching Hours: 40	**Examination Duration: 3 hrs**	

Chapter 1. Introduction: 04 Hrs

Production system facilities, Manufacturing support systems, Automation in production system, Automation principles and strategies, Manufacturing operations, Basic elements of an automated system, Advanced automation functions, Levels of automation.

Chapter 2. Material handling and identification technology: 05 Hrs

Considerations in material handling system design, 10 principles of material handling, Automated guided vehicle systems, Conveyor systems, Analysis of material transport system, Automated storage systems, Engineering analysis of storage system. Components of manufacturing systems, Single station automated cells, Applications and analysis of single station cells.

Chapter 3. Flexible manufacturing systems: 05 Hrs

FMS components, FMS application and benefits, Quantitative analysis of flexible manufacturing systems.

Chapter 4. Industrial control systems: 05 Hrs

Sensors, Actuators, Drives and other control system components. Electro-hydraulic and Electro-pneumatics in manufacturing automations

Chapter 5. Machine vision systems: 05 Hrs

Importance of machine vision system in manufacturing automation.

Chapter 6. Role of microcontrollers in manufacturing automation system 05 Hrs

Microcontroller architecture, interfacing sensors and actuators with microcontroller for industrial automation, Microcontroller programming.

Chapter 7. PLCs in manufacturing automation: 06 Hrs

Application of programmable logic controllers in manufacturing automation, PLC basic and advanced ladder logic programming using RsLogix and CoDeSys format, Usage of timers, counters, sequencing, and interlocking, latching, master control relay for developing programs for manufacturing automation. Temperature control, valve sequencing, conveyor belt control, control of a process etc

Chapter 8. SCADA for Automation: 05 Hrs

Elements of SCADA, Benefits of SCADA, Applications, Types of SCADA systems, Features and functions of SCADA, Building applications using SCADA for manufacturing automation.

Text Books

Reference Books:

1. Grover M.P., “Automation, Production Systems and Computer Integrated Manufacturing”, Pearson Education Asia.
2. Grover M.P., Weiss M. M., Nagel R.N. and Odrey N.G., “Industrial Robotics, Technology, Programming and Applications”, Mc Graw Hill Book Publications.
3. Krishna Kant, “Computer Based Industrial Control” PHI.
4. W. Bolton , “Programmable Logic Controllers” Fifth Edition, Elsevier
5. Vijay R. Jadhav, “Programmable Logic Controller”, Second Edition, Khanna Publishers.

Curriculum Content- Course wise

←Back-1Semester

Program: Master of Technology		
Course Title: Manufacturing Execution Systems		**Course Code: 25EAME707**
L-T-P: 3-0-0	**Credits: 3**	**Contact Hours: 3 hrs/week**
ISA Marks: 50	**ESA Marks: 50**	**Total Marks: 100**
Teaching Hours: 40	**Examination Duration: 3 hrs**	

Chapter 1. Enterprise and Enterprise Integration: 04 Hrs
Enterprise and its characteristics, Strategic Planning, Feedback Loops, Time Definitions, Business Processes, Manufacturing Processes, Enterprise Integration, Horizontal Integration and Interoperability, Vertical Integration and Temporal Gap, Digitalization, Standards (ISO 15704)

Chapter 2. Manufacturing Execution Systems and its Functionalities: 04 Hrs
Manufacturing Execution Systems (MES), MES Functionalities, MES Models, Manufacturing Operations Management (MOM), Functional Control Model, MES in Discrete Industry, MES in Process Industry, Standards (IEC 62264, IEC 61512, VDI 5600)

Chapter 3. Process and Data Modeling: 04 Hrs
Enterprise Modeling, Process Modeling, Business Process Modeling Language (BPMN), Sankey Diagram, Entity-Relationship Diagrams, ARIS (ARchitecture for integrated Information Systems), Integrated Definition for Function Modelling (IDEF), Event-Driven Process Chain (EPC), Data Modeling, Data Flow Diagrams (DFDs), Unified Modeling Language (UML), Business to Manufacturing Markup Language (B2MML)

Chapter 4. Data Collection: 04 Hrs
Process Analysis, Process Modeling, Data Modeling, Data Flow Diagrams (DFDs), Communication Patterns, Technologies, OPC (OLE for Process Control)

Chapter 5. Traceability And Tracking: 04 Hrs
Tracing, Traceability, Enterprise Entities, Forward and Backward Traceability, Traceability Granularity, Tracking, Tracking Approaches, Regulations (GMP, US FDA, EudraLex)

Chapter 6. PERFORMANCE MEASUREMENT: 04 Hrs
Performance Measurement, Performance Management, Performance Measurement System and Characteristics, Key Performance Indicators (KPIs), Overall Equipment Effectiveness (OEE), Metrics Maturity Model, KPI Effectiveness, Process Improvement, Standards (ISO 22400, VDMA 66412)

Chapter 7. Managerial Accounting: 04 Hrs
Managerial Accounting, Cost Assignment Techniques, Cost Hierarchal Levels, Activity Drivers, Standard Cost, Actual Cost, Job Costing, Process Costing, Activity-Based Costing (ABC), Time-Driven ABC (TDABC), Resource Consumption Accounting (RCA), Cost of Poor Quality (COPQ)

Chapter 8. Real-Time Enterprise: 04 Hrs
Real-Time Enterprise (RTE), Event-Driven Architecture (EDA), Events, Complex Event Processing (CEP)

Chapter 9. Industry 4.0: 04 Hrs
Industry 4.0, Challenges, Industrial Internet of Things (IIoT), Reference Architecture for Industry 4.0, Cyber-Physical Systems (CPS), Cyber-Physical Production Systems (CPPS), Smart Product, Smart Manufacturing, Smart Logistics, Smart Services

Chapter 10. Business Analytics and Business Intelligence, Blockchain: 04 Hrs
Knowledge Management, Case-Based Reasoning (CBR), Big Data, Decision Analytics, Descriptive Analytics, Predictive Analytics, Prescriptive Analytics, Bitcoin and Blockchain, Merkle Tree, Blockchain Types, Scope and Application of Blockchain in Manufacturing

Text Books

Reference Books:

1. SachinKaradgi, “A Reference Architecture for Real-Time Performance Measurement,” Springer, 2014.
2. OpherEtzion, Peter Niblett, “Event Processing in Action,” Manning, 2011.
3. Roger Wattenhofer, “The Science of the Blockchain,” CreateSpace Independent Publishing Platform, 2016.
4. Bruce Silver, “BPMN Method and Style - With BPMN Implementer's Guide,” Cody-Cassidy Press, 2011.
5. Charles T. Horngren, George Foster, Srikant M. Datar, Madhav V. Rajan, Chris Ittner, “Cost Accounting: A Managerial Emphasis,” Prentice Hall, 13th Edition, 2008.
6. Wood C. Douglas (Editor), “Principles of Quality Costs: Financial Measures for Strategic Implementation of Quality Management,” ASQ, 4th Edition, 2013.
7. Gary Cokins, “Activity-Based Cost Management: An Executive's Guide,” Wiley, 2001.
8. Robert S. Kaplan, Robin Cooper, “Cost & Effect: Using Integrated Cost Systems to Drive Profitability and Performance,” Harvard Business Review Press, 3rd edition, 1997.
9. ISO 15704: Industrial Automation Systems—Requirements for Enterprise-Reference Architectures and Methodologies, 2000.
10. IEC 62264: Enterprise-Control System Integration. Multi—part standard.
11. IEC 61512: Batch Control. Multi—part standard.
12. ISO 22400–2: Automation Systems and Integration—Key Performance Indicators for Manufacturing Operations Management, Multi—part standard.
13. VDI 5600 Part 1: Manufacturing execution systems (MES), 2007.
14. OPC Foundation: OPC unified architecture specification part 1: overview and concepts, http://www.opcfoundation.org/.
15. MESA, MES Explained: A high level vision, white paper number 6, 1997.GMP
16. WHO Good Practices for Pharmaceutical Quality Control Laboratories, WHO Technical Report Series, No. 957, 2010.
17. Mike Bourne, Pippa Bourne, Handbook of Corporate Performance Management, Wiley, 2011.

Curriculum Content- Course wise

←Back-1Semester

Program: Master of Technology		
Course Title: Robust Design Optimization		Course Code: 25EAME708
L-T-P: 3-0-0	**Credits: 3**	Contact Hours: 3 hrs/week
ISA Marks: 50	**ESA Marks: 50**	Total Marks: 100
Teaching Hours: 40	**Examination Duration: 3 hrs**	

Chapter 1. Robust Design Overview: 02 Hrs

Taguchi's approach to quality and quality loss function, noise factors and average quality loss, exploiting non linearity, classification of parameters

Chapter 2. Analysis of variance: 08 Hrs

No-Way ANOVA, One-Way ANOVA, Two-Way ANOVA and Three-Way ANOVA

Chapter 3. Two Level Experiments: 06 Hrs

Two factor factorial design, model adequacy checking and estimating model parameters, 2^2 full factorial design, 2^3 full factorial design, 2^k full factorial design and Two level fractional factorial design, General 2^{k-p} fractional factorial design.

Chapter 4. Steps in Robust Design: 06 Hrs

Identification of process and its main function, Noise factors and testing conditions, Control factors and their levels, Matrix experiment and data analysis plan, Conducting the experiment and data analysis, Verifying experiment and future plan.

Chapter 5. Signal to Noise Ratios: 06 Hrs

Comparison of the quality of two process conditions, Relationship between Signal to Noise Ratio and quality loss after adjustment, Identification of a scaling factor, Signal to Noise Ratios for static problems, Signal to Noise Ratios for dynamic problems, Analysis of ordered categorical data.

Chapter 6. Taguchi Inner and Outer arrays: 06 Hrs

Orthogonal arrays and fractional factorial designs, Parameter design and tolerance design, Analysis of inner/outer array experiment, Alternative inner/outer orthogonal array experiments.

Chapter 7. Constructing orthogonal arrays: 06 Hrs

Dummy level technique, Compound factor method, Linear graphs and Interaction assignment, Modification of linear graphs, Column merging method, Branching design.

Text Books

Reference Books:

1. Montgomery, D. C., "Design and Analysis of Experiments", John Wiley & Sons.
2. Khuri A. I. and Cornell J. A. "Response Surfaces: Designs and Analyses, Marcel Dekker, Inc., New York.
3. Myers R. H., Montogomery, D. C. and Anderson-Cook C. M. "Response Surface Methodology: Process and Product Optimization Using Designed Experiments", John Wiley & sons, Inc., New York.
4. Mason R. L., Gunst, R. F., Hess J. L., "Statistical design and Analysis of Experiments with Applications to Engineering and SISAnce", John Wiley & sons, Inc., New York.
5. Phadke M. S., "Quality Engineering using Robust Design", Prentice Hall PTR Englewood Cliffs, New Jersy.
6. Ross P. J., "Taguchi Techniques for Quality Engineering", McGraw -Hill International.

Curriculum Content- Course wise

←Back-1Semester

Program: Advanced Manufacturing Systems		**Semester: I**
Course Title: Collaborative Design - Modelling Lab		**Course Code: 25EAMP701**
L-T-P: 0-0-3	**Credits: 3**	**Contact Hours: 6 Hrs/week**
ISA Marks: 80	**ESA Marks: 20**	**Total Marks: 100**
Teaching Hours: 72	**Examination Duration: 3 Hrs**	
Module 1. User Interface Platform Understand the user interface, connect to the plm platform, access your dashboard, use the tags for searching content, share various documents with other users through, 3dspace, use standard menus and commands, import new data and export to required file formats, search for a 3d data using different methods, explore and open 3d data, manipulate the tree, filter data **Module 2. Sketcher and Part Design** Exercises on sketch tools, profile tool bar and constraint tool bar, Exercise on 3D models using pad, slot, shaft, groove, hole, rib and stiffener commands, cut revolve etc.		
Module 3. Generative Shape Design (GSD) Exercises using GSD to generate complicate surfaces using sub tool bars **Module 4. Sheet Metal** Setting sheet metal parameters, bend extremities tab, creating the base wall, creating the wall on edge, creating extrusions etc.		
Module 5. Assembly Design and Drafting Assembly design work bench Bottom-Up and Top-Down assembly approaches invoking existing components into assembly work exercise to demonstrate Top-Down assembly approach, Converting existing 3D models into 2D drawings with all relevant details, sectional views etc.		
Reference: 1. Companion Courses – https://companion.3ds.com/		

Program: Advanced Manufacturing Systems		Semester: I
Course Title: ERP Functional Lab		Course Code: 25EAMP703
L-T-P: 0-0-3	Credits: 3	Contact Hours: 6 Hrs/week
ISA Marks: 80	ESA Marks: 20	Total Marks: 100
Teaching Hours: 72	Examination Duration: 3 Hrs	

Module 1. ERP Package Selection and Overview

ERP life cycle: selection, implementation, maintenance, and upgrades; ERP package selection criteria; overview of popular Indian ERP vendors

Module 2. Financial Accounting

Importance of financial modules in ERP systems, linkages between financial accounting and other ERP modules; basic finance – chart of accounts, journal entries, journal vouchers, exchange rates; banking (In and Out); debit and credit note.

Module 3. Master Data Management

Data governance and lifecycle management; Item master: SKU details, units of measure, inventory valuation, item categorization; Business partner master – customer, vendor; Pricing; Tax

Module 4. Supply Chain Management

Sales: sales quotation, sales order, delivery, return, invoice (A/R).
Purchase: purchase quotation, purchase order, return, GRN, invoice (A/P).
Inventory: stock levels, warehouse locations, stock transfers.
Production: assembly BOM, production order, goods issue, goods receipt.

Module 5. Reports

Generation of reports for various functional modules.

Reference:

1. SAP Business One Manual
2. https://help.sap.com/docs/SAP_BUSINESS_ONE

Curriculum Content- Course wise

←Back-1Semester

Program: Advanced Manufacturing Systems		**Semester: I**
Course Title: PLM Functional Lab		**Course Code: 25EAMP702**
L-T-P: 0-0-3	**Credits: 3**	**Contact Hours: 6 Hrs/week**
ISA Marks: 80	**ESA Marks: 20**	**Total Marks: 100**
Teaching Hours: 72	**Examination Duration: 2 Hrs**	
Module 1. Collaborations and Approvals Collaboration business innovator role, 3d swymer, project planner, business process designer, business process planner, lean team player, collaborative industry innovator, collaborative spaces, organizing content, capture information, manage time and collaborative task, issue management. **Module 2. IP Classifications** Classification manager role, overview, libraries and classes, classification attributes, classify the content.		
Module 3. Change Management Product release engineer role, 3D product architect role, collaborate for enterprise change management, evaluate change management, implement decision engineering and manufacturing changes, validate and release changes. **Module 4. Project Management Fundamentals** Project planner role, define and create project, modify and update task, create sub-project, work on task, review task deliverables.		
Module 5. Risk Management Project portfolio manager role, risk management, mitigate risks, identify and manage issues, optimize task execution.		
Reference: 1. Companion Courses – https://companion.3ds.com/		

Curriculum Content- Course wise

←Back 2semester

Program: Advanced Manufacturing Systems		**Semester: II**
Course Title: Advanced Technologies in PLM		**Course Code: 25EAMC705**
L-T-P: 3-1-0	**Credits: 4**	**Contact Hours: 5 Hrs/week**
ISA Marks: 50	**ESA Marks: 50**	**Total Marks: 100**
Teaching Hours: 40	**Examination Duration: 3 Hrs**	

Unit I

Chapter 1. IoT and Digital Twins in PLM: 8 hrs

Background to IoT, other IoT building blocks, addressing large data volumes in IoT, benefits of use of the IoT, digital twins, a digital model of a product, setting the scene for digital twins, benefits and concern with use of digital twins, potential difficulties and success factors of digital twin.

Chapter 2. Digital Twins in the Ideation and Definition Phases of the Product Lifecycle: 8 hrs

Activities in the ideation and definition phases, challenges in the ideation and definition phases, digital models for accelerated product ideation and definition, digital models in simulation for product development, digital models in virtual prototyping, digital models for decision support in product development, digital models in product documentation, industry examples of digital models in the ideation and product development phases.

Unit II

Chapter 3. Digital Models and Digital Twins in Product Marketing and Sales in PLM: 8 hrs

Digital models and digital twins in product marketing and sales, activities in product marketing and sales, issues in product marketing and sales, digital models and twins in product marketing and sales, benefits of digital models and twins in product marketing and sales, potential risks with digital twins in marketing and sales, industry examples of digital models and digital twins in product marketing and sales.

Chapter 4. Digital Twins in the Product Realisation Phase in the Product Lifecycle: 7 hrs

Digital models and digital twins in the product realisation phase, activities in the product realisation phase, issues in the product realisation phase, digital models and twins in product realisation, benefits of digital models and twins in product realisation, industry examples of digital models and digital twins in product realisation.

Unit III

Chapter 5. Digital Twins in the Product Support and Disposal Phases of the Product Lifecycle: 10 hrs

Digital models and digital twins in the product support and disposal phases, activities in the product support and disposal phases, challenges in the product support and disposal phases, digital twins in product support and disposal, benefits of digital twins in product support and disposal, potential risks with digital twins in the product support and disposal phases, implementing digital twins, a digital twin vision, steps in the digital twin program.

Reference Books:

1. Stark John, "Product Lifecycle Management: Volume 7 – PLM and Digital Twins", Springer, 2024

Program: Advanced Manufacturing Systems		Semester: II
Course Title: Project Feasibility and Analysis		Course Code: 25EAMC707
L-T-P: 3-0-0	Credits: 3	Contact Hours:3 Hrs/week
ISA Marks: 50	ESA Marks: 50	Total Marks: 100
Teaching Hours: 40	Examination Duration: 3 Hrs	

Unit I

Chapter 1. Planning Overview: 8 hrs

Capital investments, types of capital investments, phases of capital budgeting, levels of decision-making, facets of project analysis, key issues in major investment decisions, objectives of capital budgeting, common weaknesses in capital budgeting.

Chapter 2. Market and Demand Analysis: 8 hrs

Concept of strategy, portfolio strategy, business level strategies, strategic planning and capital budgeting, generation of ideas, situational analysis, specification of objective, portfolio management

techniques, conduct of market survey, characteristics of market, swot analysis, demand forecasting, uncertainties in demand forecast, marketing plan.

Unit II

Chapter 3. Technical Analysis: 8 hrs

Manufacturing process/technology, material inputs and utilities, product mix and plant capacity, project charts and layouts.

Means of finance, estimates of sales and production, cost of production, working capital requirement

Unit I

Chapter 1. ERP implementation Basics: 7 hrs

Chapter 5. Sustainability Analysis: 8 hrs

The concept of sustainability, sustainability in project management, inter-relating life cycles, the impact of sustainability on project management processes, measuring and reporting projects, the impact of sustainability on project management competencies.

Reference Books:

1. Prasanna Chandra, "Projects: Planning, Analysis, Financing, Implementation and Review", Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. Nicholas J. M. and Steyn H. "Project Management for Business, Engineering and Technology: Principles and Practice", Elsevier.
3. Harold R. Kerzner, "Project Management: A Systems Approach to Planning, Scheduling, and Controlling", Wiley, New York.

Program: Advanced Manufacturing Systems		Semester: II
Course Title: ERP System Implementation and Management		**Course Code: 25EAMC706**
L-T-P: 3-0-0	**Credits: 3**	**Contact Hours: 3 Hrs/week**
ISA Marks: 50	**ESA Marks: 50**	**Total Marks: 100**
Teaching Hours: 40	**Examination Duration: 3 Hrs**	

Curriculum Content- Course wise

←Back 2semester

Master data management – item master, vendor master, COA, customer master, machine master, etc. vendors- role of vendor; consultants: types of consultants; role of a consultant, employees; role of employees; resistance by employees; dealing with employee resistance, role of top management, role of implementation partner.

Chapter 2. ERP implementation Life cycle: 8 hrs

Objectives of ERP implementation, different phases of ERP implementation. consultants, vendor and employees; ERP projects: project types, implementation methodology, project preparation, business blueprinting, gap analysis, realization, final preparation, go live and support, user training; ERP post implementation: maintenance of ERP- organizational and industrial impact; success and failure factors and ERP implementation; difference between implementation, upgrade & re-implementation; configuration vs customization in ERP project.

Unit II

Chapter 3. ERP and e-Business: 8 hrs

Introduction ERP and e-business process model, components of e-business supply chain ERP/ e-business integration ERP to ERP II –bringing ERP to the entire enterprise.

SCM in relation to ERP; e-procurement; e-logistics; internet auctions; e-markets; electronic business process optimization; business objects in SCM; e-commerce.

Chapter 4. Future Directions in ERP: 7 hrs

Faster implementation methodologies; business modules and BAPIS; convergence on windows NT; application platform; new business segments; more features; web enabling; market snapshot.

Unit III

Chapter 5. Case Studies: 10 hrs

ERP case studies in HRM, finance, production, product database, materials, sales & distribution.

Reference Books:

1. Ellen Monk & Bret Wagner, Concepts in Enterprise Resource Planning, 4th edition, Course Technology CENGAGE Learning.
2. Alexis Leon, Enterprise Resource Planning, 3rd edition, Mcgraw Higher Ed.
3. Vinod Kumar Garg, N.K. Venkitakrishnan, EntERPrise Resource Planning: Concepts and Practice, 2nd edition, Prentice Hall India Learning Private Limited.
4. Pauline Weetman, Financial and Management Accounting: An Introduction, Pearson Education Limited.

Curriculum Content- Course wise

←Back 2semester

Program: Master of Technology		**Semester: II**
Course Title: Research Methodology		**Course Code: 20EAMC708**
L-T-P: 2-1-0	**Credits: 3**	**Contact Hours: 5 hrs/week**
ISA Marks: 100	**ESA Marks: --**	**Total Marks: 100**
Teaching Hours: 26	**Examination Duration: --**	
Research: Definition, Characteristics and Objectives; Types of Research, Research Methodology, Research Process, Literature Review, Review concepts and theories, Formulation of Hypothesis, Research design, Data collection, Processing and analysis of data collected, Interpretation of data, Computer and internet: Its role in research, Threats and Challenges to research, Writing a research paper, research project, Thesis, Research ethics, Citation methods and rules. Case studies.		
Text Books		
Reference Books: 1. Kothari C. R. "Research Methodology – Methods & Techniques", WishwaPrakashan, 2. Ranjit Kumar, "Research Methodology – A step by step guide for Beginners", 3rd Edition, Pearson Edition, Singapore, 2011. 3. Dawson Catherine, "Practical Research Methods", UBS Publishers, New Delhi, 2002.		

Curriculum Content- Course wise

←Back 2semester

Program: Advanced Manufacturing Systems		**Semester: II**
Course Title: Additive Manufacturing		**Course Code: 25EAME705**
L-T-P: 3-0-0	**Credits: 3**	**Contact Hours:3 Hrs/week**
ISA Marks: 50	**ESA Marks: 50**	**Total Marks: 100**
Teaching Hours: 40	**Examination Duration: 3 Hrs**	

Unit I

Chapter 1. Additive Manufacturing (AM) Overview: 8 hrs

Introduction to reverse engineering traditional manufacturing vs AM, computer aided design (CAD) and manufacturing (CAM) vs AM, different am processes and relevant process physics, AM process chain application level: direct processes – rapid-prototyping, rapid tooling. rapid manufacturing; indirect processes - indirect prototyping. indirect tooling, indirect manufacturing

Chapter 2. Materials Science of AM: 8 hrs

Discussion on different materials used, use of multiple materials, multifunctional and graded materials in AM, role of solidification rate, evolution of non-equilibrium structure, structure property relationship, grain structure and microstructure

Unit II

Chapter 3. AM Technologies: 8 hrs

Powder-based am processes involving sintering and melting (selective laser sintering, shaping, and electron beam melting. involvement). Printing processes (droplet-based 3D solid-based am processes - extrusion based fused deposition modelling object stereo-lithography micro- and nano-additive.

Chapter 4. Mathematical Models for AM: 8 hrs

Transport phenomena models: temperature, fluid flow and composition, buoyancy driven tension driven free surface flow pool) case studies: numerical modelling of am process, powder bed melting based process, droplet based printing process residual stress, part fabrication time, cost, optimal orientation and optimal defect in am and role of transport simulations (choice of parameter, model validation for different.

Unit III

Chapter 5. Process selection, planning, control for AM: 8 hrs

Selection of am technologies using decision methods. Additive manufacturing process plan: strategies and post processing. Monitoring and control of defects, transformation.

Reference Books:

1. Ian Gibson, David W. Rosen, Brent Stucker, “Additive manufacturing technologies: rapid prototyping to direct digital manufacturing”, Springer, 2010.
2. Andreas Gebhardt, “Understanding additive manufacturing: rapid prototyping, rapid tooling, rapid manufacturing”, Hanser Publishers, 2011.
3. J.D. Majumdar and I. Manna, “Laser-assisted fabrication of materials”, Springer Series in Material Science, e-ISBN: 978-3-642- 28359-8.
4. L. Lu, J. Fuh and Y.-S. Wong, “Laser-induced materials and processes for rapid prototyping”, Kluwer Academic Press, 2001.

Curriculum Content- Course wise

←Back 2semester

Program: Advanced Manufacturing Systems		**Semester: II**
Course Title: PLM Advanced Lab		**Course Code: 25EAMP704**
L-T-P: 0-0-3	**Credits: 3**	**Contact Hours: 6 Hrs/week**
ISA Marks: 80	**ESA Marks: 20**	**Total Marks: 100**
Teaching Hours: 72	**Examination Duration: 2 Hrs**	
Module 1. Project Planning and Execution Project planner role in agile method, Kanban board and agile project, project backlog and iterations, update and review iterations tasks, manage iteration and backlogs items, project planner manager role. **Module 2. Variant Management and Essentials** Model definition app, increase design efficiency with variant dictionary, control buildable combining with variability rules, meet market needs with product configurations.		
Module 3. Traceability Management System traceability analyst role, prepare session and navigate data, study and create requirement specification, answer stakeholder needs, sub-system requirements, system traceability analyst role for patterns. **Module 4. Requirement Management Essentials** Requirements engineering role, specification tree, import requirements, manage links in tree, classify requirements, revision for tree, change control and requirements.		
Module 5. Configuration Management Streamline engineering to manufacturing, define product portfolio, prepare and configure engineering definition, complete engineering and manufacturing definition.		
Reference: 1. Companion Courses – https://companion.3ds.com/		

Curriculum Content- Course wise

←Back 2semester

Program: Advanced Manufacturing Systems		**Semester: II**
Course Title: ERP Advanced Lab		**Course Code: 25EAMP705**
L-T-P: 0-0-3	**Credits: 3**	**Contact Hours: 6 Hrs/week**
ISA Marks: 80	**ESA Marks: 20**	**Total Marks: 100**
Teaching Hours: 72	**Examination Duration: 3 Hrs**	
Module 1. Advanced Financial Accounting Advanced Fixed assets management: configuration of asset master data, asset classes, and depreciation methods; budgeting: defining budget scenarios, cost centers, accounts; cost center accounting: defining cost centers and distribution rules **Module 2. MRP** Creating and managing sales forecasts, running MRP Wizard, interpreting MRP Results		
Module 3. Admin and Technical System initialization: setting up company details, posting periods, document numbering, user permissions; set-up, technical Enhancement – UI, report – query generation, crystal report, print layout design, basics of Integration **Module 4. Implementation Case Studies** Sales module implementation: end-to-end cycle: quotation → order → delivery → invoicing → payment Purchase module implementation: requisition planning to procurement cycle Production module implementation: multi-level BOM setup, production order flow, WIP tracking Implementation challenges and best practices		
Module 5. Reports Generation of reports for various functional modules.		
Reference: 1. SAP Business One Manual 2. https://help.sap.com/docs/SAP_BUSINESS_ONE		

Curriculum Content- Course wise

←Back 2semester

Program: Master of Technology		**Semester: II**
Course Title: Mini Project		**Course Code: 20EAMW701**
L-T-P: 0-0-3	**Credits: 3**	**Contact Hours: 6 hrs/week**
ISA Marks: 50	**ESA Marks: 50**	**Total Marks: 100**
Teaching Hours: 24	**Examination Duration: 2 hrs**	
At the end of the course students will be able to independently carry out research /investigation and development work to solve practical problems. Students should be able to use modern tools in the area of PLM and ERP to solve real-time problems/case studies. Also, they must be able to write and present a substantial technical report/document.		
Text Books		
Reference Books: Companion Courses – https://companion.3ds.com/		