

## **ONE YEAR FULL TIME POST GRADUATE DIPLOMA IN PRODUCT LIFECYCLE MANAGEMENT (PG-PLM)**

### **About the Course**

In today's rapidly evolving industrial landscape of I4.0, efficient management of product lifecycles is critical for organizations to stay competitive. Product Lifecycle Management (PLM) plays a pivotal role in streamlining processes, reducing time-to-market, and ensuring product quality. To address the growing demand for skilled PLM professionals, there is requirement of a comprehensive PLM course, encompassing software training, lab practices, and internship projects. Industry expects universities to impart skills related to PLM processes.

The need for proficient PLM professionals is escalating across various industries including manufacturing, automotive, aerospace, and consumer goods. However, there's a notable gap in the availability of specialized training programs tailored to PLM and industry requirements. This course aims to bridge this gap by equipping students with the necessary knowledge and skills to excel in PLM roles.

The PLM course will cover a wide array of topics including but not limited to: Introduction to Product Lifecycle Management, PLM Software Tools and Applications, Data Management and Version Control, Collaborative Product Development, Change Management, Integration with Enterprise Systems, - Project Management in PLM Context etc..

The course will be delivered through a combination of offline and online lectures to ensure flexibility and accessibility for students and subject experts. Additionally, hands-on lab practices will be conducted to provide practical experience with PLM software tools. Furthermore, students will undertake internship projects with industry partners, enabling them to apply their knowledge in real-world scenarios and gain valuable industry exposure.

Upon completion of the PLM course, graduates will be well-equipped to pursue a multitude of rewarding career opportunities. PLM professionals are in high demand across industries, with roles such as PLM Analyst, PLM Consultant, Product Data Manager, and PLM Administrator offering lucrative career prospects. By catering to the industry's demand for proficient PLM professionals, this course will not only enhance the employability of graduates but also contribute to the continued advancement of organizations leveraging PLM practices.

**STRUCTURE OF ONE YEAR FULL TIME POST GRADUATE DIPLOMA IN  
PRODUCT LIFECYCLE MANAGEMENT (PG-PLM)**

**Semester I**

Sr. No.	Course code	Course Name	Teaching Scheme				Credits
			L	T	P	S	
1	PGPLM1	PLM an PDM Fundamentals (36)	3	0	0	3	3
2	PGPLM2	Business Process Management (36)	3	0	0	3	3
3	PGPLM3	PLM Functional (36)	2	1	0	2	3
4	PGPLM4	PLM Administration (36)	2	1	0	2	3
5	PGPLM5	PLM Customization (36)	2	1	0	4	3
6	PGPLM6	PLM Functional Lab (48)	0	0	4	0	2
7	PGPLM7	PLM Administration Lab (48)	0	0	4	0	2
8	PGPLM8	CAD/CAE Lab (24)	0	0	2	0	1
9	PGPLM9	Programming, web and Networking Technologies Lab (24)	0	0	2	0	1
10	PGPLM10	PLM Customization Lab (24)	0	0	2	0	1
11	PGPLM11	Project I	0	0	0	2	6
		Total	12	3	12	16	25
		<b>Total Academic Engagement and Credits</b>	<b>27</b>				<b>28</b>

**Semester II**

Sr. No.	Course code	Course Name	Teaching Scheme				Credits
			L	T	P	S	
12	PGPLM12	Industry practices and PLM Implementation	3	0	0	3	3
13	PGPLM13	Seminar	0	0	0	2	1
14	PGPLM14	Industry internship Project II	0	0	0	18	18
		Total	0	0	0	21	22
		<b>Total Academic Engagement and Credits</b>	<b>3</b>				<b>22</b>
<b>Course Total Credit</b>							<b>50</b>

**Course: PLM an PDM Fundamentals**

<b>Course Code</b>	PGPLM1	<b>Scheme of Evaluation</b>	CE & ESE
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<b>Teaching Plan</b>	3-0-0-3 = 6	<b>T1 &amp; T2</b>	20 Each
<b>Credits</b>	3	<b>ESE</b>	60

**Course Objectives:** Upon completion of this course, students will be able to:

1. Understand the fundamental concepts, significance, and benefits of Product Lifecycle Management (PLM) and Product Data Management (PDM) in modern industries.
2. Recognize the components, elements, and key management issues surrounding PLM and PDM implementation.
3. Analyze the integration of Industry 4.0 technologies with PLM and PDM systems and their impact on digital transformation.
4. Develop comprehensive strategies for PLM and PDM implementation aligned with company vision and objectives.
5. Implement advanced techniques such as data analytics, predictive maintenance, and digital twin technology to optimize product lifecycle processes.

**Syllabus:**

<b>Unit No.</b>	<b>Content</b>	<b>Lecture</b>	<b>Self-study</b>
<b>01.</b>	<b>Introduction to Product Lifecycle Management (PLM)</b>  Background and Overview of Product Lifecycle Management, Need, Benefits, and Significance of PLM, Components and Elements of PLM, Emergence of PLM Strategies, Customer Involvement and PLM Vision, Principles for Developing and Implementing PLM Strategy, Integration of Industry 4.0 technologies with PLM systems and their impact on digital transformation.	<b>6L</b>	<b>3S</b>
<b>02</b>	<b>Product Lifecycle Environment</b>  Understanding Product Data and Product Workflow, Link between Product Data and Product Workflow, Key Management Issues around Product Data, Company's PLM Vision and Strategy Alignment, Developing a Comprehensive PLM Strategy, Change Management for PLM Implementation, Optimizing product lifecycle processes using data analytics techniques for analyzing product lifecycle data and implementing predictive maintenance strategies.	<b>6L</b>	<b>2S</b>

<b>03</b>	<b>Components and Practices of PLM</b>  Different Phases of Product Lifecycle and Corresponding Technologies, Product Development Processes and Methodologies, Foundation Technologies and Standards for PLM, Interoperability standards and their significance, Information Authoring Tools and Core Functions in PLM, Functional Applications such as Configuration Management, Human Resources and Organizational Structures in PLM	<b>6L</b>	<b>2S</b>
<b>04</b>	<b>Introduction to Product Data Management (PDM)</b>  Benefits and Terminology of PDM, CIM Data and Engineering Data Management, Architecture and Functions of PDM Systems, Engineering Workflow and PDM Acquisition, Resolving Data Issues and Product Data Interchange, Need for Collaboration and Internet Developments in Client Server Computing, Data governance frameworks and cybersecurity measures specific to PDM systems	<b>6L</b>	<b>2S</b>
<b>05</b>	<b>Components and Configuration Management in PDM</b>  Components of a Typical PDM Setup: Hardware and Document Management, Creation and Viewing of Documents, Parts, and Documents Version Control, Configuration Management: Base Lines and Product Structure, Generic Products and Variants: Product Configuration and Variant Creation, Projects, Roles, and Automation of Information Flow in PDM, Change Management: Change Issue, Request, Investigation, Proposal, and Activity, Digital twin technology and its application in virtual prototyping, simulation, and product optimization	<b>6L</b>	<b>2S</b>
<b>06</b>	<b>Deployment Models and Advanced Topics in PDM</b>  Defining Deployment Methodology and Performance Considerations, Network Latency and Scalability in PDM Systems, Standard Technologies Available for PDM Deployment, Advanced Topics: Digital Twins, Simulation Techniques, and Virtual Prototyping, Business Process Innovation and Implementation in PDM Environment, Ethical Considerations and Societal Impacts of PDM and PLM Integration, cloud deployment models	<b>6L</b>	<b>2S</b>

Course Outcomes: Course Outcomes: Students will be able to

1. Understand the link between product data and workflow in the product lifecycle environment.

Comprehend the integration of Industry 4.0 technologies with PLM and PDM systems.

2. Apply data analytics techniques for analyzing product lifecycle data and implementing predictive maintenance strategies. Apply digital twin technology for virtual prototyping, simulation, and product optimization.

3. Analyze different phases of the product lifecycle and corresponding technologies. Analyze the foundation technologies, standards, and functional applications in PLM and PDM.

4. Evaluate the effectiveness of PLM and PDM strategies in optimizing product lifecycle processes. Evaluate the ethical considerations and societal impacts of PDM and PLM integration.

5. Design comprehensive PLM and PDM strategies tailored to specific industry needs. Develop innovative approaches for business process innovation and implementation in PDM environment.

#### Reference Books:

1. T. Williams, "The Principles of Product Development Flow: Second Generation Lean Product Development," Celeritas Publishing, United States, 2009.

2. M. Grieves, "Product Lifecycle Management: Driving the Next Generation of Lean Thinking," McGraw-Hill Education, United States, 2006.

3. J. Stark, "Product Lifecycle Management: 21st Century Paradigm for Product Realisation," Springer, United States, 2011.

4. M. Weske, "Business Process Management: Concepts, Languages, Architectures," Springer, Germany, 2018.

5. J. Stark, "Product Lifecycle Management: 21st Century Paradigm for Product Realisation," Springer, United States, 2011.

- 6.2. R. H. Hayes, "Managing and Using Information Systems: A Strategic Approach," John Wiley & Sons, United States, 2020.

7. M. N. Waldron, "Competitive Manufacturing Management: Continuous Improvement," Springer, United States, 2019.

8. M. O. Efe, "Enterprise Architecture and Integration: Methods, Implementation, and Technologies," IGI Global, United States, 2013.

### Course: BUSINESS PROCESS MANAGEMENT

<b>Course Code</b>	PGPLM2	<b>Scheme of Evaluation</b>	CE & ESE
<b>Teaching Plan</b>	3-0-0-3 = 6	<b>T1 &amp; T2</b>	20 Each
<b>Credits</b>	3	<b>ESE</b>	60

**Course Objectives:** Upon completion of this course, students will be able to:

1. Evaluate and analyze business processes within the context of Product Lifecycle Management (PLM) and Industry 4.0.
2. Design and implement efficient business processes utilizing modern PLM software tools and techniques.
3. Synthesize theoretical knowledge with practical skills to address real-world challenges in PLM and Industry 4.0 environments.
4. Collaborate effectively in interdisciplinary teams to develop innovative solutions for process improvement and digital transformation.
5. Critically assess the ethical and societal implications of business process management in the context of Industry 4.0.

#### **Syllabus:**

<b>Unit No.</b>	<b>Content</b>	<b>Lecture</b>	<b>Self-study</b>
<b>01.</b>	<b>Introduction to Business Process Management and PLM</b> Overview of business process management principles, Introduction to Product Lifecycle Management (PLM), Role of PLM in digital transformation and Industry 4.0	<b>6L</b>	<b>3S</b>
<b>02</b>	<b>Process Modeling and Analysis</b> Techniques for process modelling, Process analysis methods, Case studies and practical exercises	<b>6L</b>	<b>2S</b>
<b>03</b>	<b>Process Management</b> Design process management, Project and Change management in the context of PLM and Industry 4.0,	<b>6L</b>	<b>2S</b>
<b>04</b>	<b>Process Optimization and Automation</b> Principles of process optimization, Automation technologies in Industry 4.0, Implementation of process automation solutions	<b>6L</b>	<b>2S</b>

<b>05</b>	<b>Digital Twin and Simulation</b> Concept of digital twin in PLM, Simulation techniques for process optimization, Virtual prototyping and validation	<b>6L</b>	<b>2S</b>
<b>06</b>	<b>Business Process Innovation and Implementation</b> Strategies for business process innovation, Ethical considerations and societal impacts of business process management	<b>6L</b>	<b>2S</b>

Course Outcomes: Students will be able to

1. Explain the significance of business process management in the context of PLM and Industry 4.0. Interpret the role of digital technologies in transforming business processes.
2. Utilize PLM software tools to model, simulate, and optimize business processes. Implement process automation solutions using Industry 4.0 technologies such as IoT and AI.
3. Assess the effectiveness and efficiency of existing business processes in the context of PLM and Industry 4.0. Analyse data generated from PLM systems to identify areas for process improvement.
4. Critique different approaches to process optimization and automation, considering their suitability for specific organizational contexts. Evaluate the impact of business process management initiatives on organizational performance and competitiveness.
6. Design innovative business processes that leverage advanced PLM capabilities and Industry 4.0 technologies. Develop implementation plans for integrating PLM and business process management strategies within organizations.

#### **Reference Books:**

1. M. Grieves, "Product Lifecycle Management: Driving the Next Generation of Lean Thinking," United States: McGraw-Hill Education, 2006.
2. M. Laguna and J. Marklund, "Business Process Modeling, Simulation and Design," United States: Pearson, 2017.
3. R. Brown, B. Krishnamachari, and T. Q.S. Quek, "Introduction to Industry 4.0: The Industrial Internet of Things," United States: CRC Press, 2019.
4. T. M. Siebel, "Digital Transformation: Survive and Thrive in an Era of Mass Extinction," United States: RosettaBooks, 2019.
5. J. A. McDonald and M. Grieves, "Digital Twins: Principles, Practices, and Real-World Applications," United States: CRC Press, 2020.

### Course: PLM FUNCTIONAL

<b>Course Code</b>	PGPLM3	<b>Scheme of Evaluation</b>	CE & ESE
<b>Teaching Plan</b>	2-1-0-2 = 5	<b>T1 &amp; T2</b>	20 Each
<b>Credits</b>	3	<b>ESE</b>	60

**Course Objectives:** Upon completion of this course, students will be able to:

1. Design and implement efficient business processes utilizing modern PLM software tools and techniques.
2. Synthesize theoretical knowledge with practical skills to address real-world challenges in PLM and Industry 4.0 environments.

**Syllabus:**

<b>Unit No.</b>	<b>Content</b>	<b>Lecture</b>	<b>Tutorials</b>	<b>Self-study</b>
<b>01.</b>	Overview of popular PLM software, Teamcenter PLM terms and concepts, rich client user interface,	<b>4L</b>	<b>2T</b>	<b>3S</b>
<b>02</b>	Locate, view, and report on product data, Create Teamcenter PLM items and update properties, Protect and access product data	<b>4L</b>	<b>2T</b>	<b>2S</b>
<b>03</b>	View, build, and edit product structure, standard product data in product structures	<b>4L</b>	<b>2T</b>	<b>2S</b>
<b>04</b>	Locate and view visualization data and perform basic markup and measurement functions	<b>4L</b>	<b>2T</b>	<b>2S</b>
<b>05</b>	Assign tasks using Teamcenter PLM, perform tasks, and track the completion of tasks in a workflow process,	<b>4L</b>	<b>2T</b>	<b>2S</b>
<b>06</b>	Find, interrogate, and create change objects, Verify the change configuration	<b>4L</b>	<b>2T</b>	<b>2S</b>



**Course: PLM ADMINISTRATION**

<b>Course Code</b>	PGPLM4	<b>Scheme of Evaluation</b>	CE & ESE
<b>Teaching Plan</b>	2-1-0-2 = 5	<b>T1 &amp; T2</b>	20 Each
<b>Credits</b>	3	<b>ESE</b>	60

**Syllabus:**

<b>Unit No.</b>	<b>Content</b>	<b>Lecture</b>	<b>Tutorials</b>	<b>Self-study</b>
<b>01.</b>	Application Administration Processes, Managing the Teamcenter Organization,	<b>4L</b>	<b>2T</b>	<b>3S</b>
<b>02</b>	Data Security Implementation and Best Practices, Managing Projects to Control Access to Data	<b>4L</b>	<b>2T</b>	<b>2S</b>
<b>03</b>	Managing Preferences, Custom Query Definitions, Managing Custom Report Definitions, PLM XML Import Export, Workflow Process Development and Administration, Rich Client Interface Configuration Using Stylesheets	<b>4L</b>	<b>2T</b>	<b>2S</b>
<b>04</b>	Overview of Teamcenter PLM's two-tier and four-tier architecture, PLM database creation such as Oracle, MSSQL, Corporate server installation, Common licensing server	<b>4L</b>	<b>2T</b>	<b>2S</b>
<b>05</b>	Overview of File Management System (FMS), Installation of Two-tier rich client, Server manager for Teamcenter PLM and Teamcenter J2EE Web Tier, Teamcenter .NET Web tier and Teamcenter PLM server manager	<b>4L</b>	<b>2T</b>	<b>2S</b>
<b>06</b>	Four-tier rich client installation by using Over-the-web Install and TEM, Business Modeler IDE installation, FSC performance cache server, Administering the in-product system, Dispatcher, Store and Forward, Embedded visualization for the four-tier and two-tier rich clients, PLM NX Integration for the two-tier and four-tier rich clients, installing and accessing Teamcenter online help	<b>4L</b>	<b>2T</b>	<b>2S</b>

**Course: PLM CUSTOMIZATION**

<b>Course Code</b>	PGPLM5	<b>Scheme of Evaluation</b>	CE & ESE
<b>Teaching Plan</b>	2-1-0-2 = 5	<b>T1 &amp; T2</b>	20 Each
<b>Credits</b>	3	<b>ESE</b>	60

**Syllabus:**

<b>Unit No.</b>	<b>Content</b>	<b>Lecture</b>	<b>Tutorials</b>	<b>Self-study</b>
<b>01.</b>	Data models and BMIDE configuration, C / C++ programming, Java, ReactJS, HTML, Networking and Security	<b>4L</b>	<b>2T</b>	<b>40S</b>
<b>02</b>	<b>Business Modeler Administration</b> Business Modeler IDE process, Business objects and properties, Lists of values in BMIDE, Options, constants, and rules in BMIDE, Users, groups, and roles in BMIDE, Preferences in BMIDE, Organizations in BMIDE, Data security in BMIDE, Process templates in BMIDE	<b>4L</b>	<b>2T</b>	<b>2S</b>
<b>03</b>	<b>Server Customization -I</b> Overview of Teamcenter PLM Server Side (ITK) Customization, ITK Overview and Batch Programs, SOA Overview and Batch Programs,	<b>4L</b>	<b>2T</b>	<b>2S</b>
<b>04</b>	<b>Server Customization -II</b> Workflow Handlers, Property Operations, Application Extensions, Services and Service Operations, Rich Client Customization, Rich Client Style Sheets	<b>4L</b>	<b>2T</b>	<b>2S</b>
<b>05</b>	<b>Teamcenter Client Customization</b> Rich client Configuration and dialog, StyleSheets, Kernel API and its components, Service Oriented Architecture (SOA), Teamcenter Services framework, Teamcenter Services Organization,	<b>4L</b>	<b>2T</b>	<b>2S</b>

	BMIDE for Teamcenter Services, Generated Client Stub- bindings			
<b>06</b>	<b>Active Workspace client (AWC) Configuration and Customization</b> Overview Active Workspace, Gateway Tiles, Active Workspace Icons, Indexing in Teamcenter, Active Workspace Style Sheets, Declarative and GWT, CSS Modules, Custom Themes	<b>4L</b>	<b>2T</b>	<b>2S</b>

**Course: PLM FUNCTIONAL LAB**

<b>Course Code</b>	PGPLM6	<b>Scheme of Evaluation</b>	CE & ESE
<b>Teaching Plan</b>	0-0-4-0 = 4	<b>T1 &amp; T2</b>	20 Each
<b>Credits</b>	1	<b>ESE</b>	60

**Syllabus:**

<b>Unit No.</b>	<b>Content</b>	<b>Practical</b>	<b>Self-study</b>
<b>01.</b>	<b>Rich client Navigation</b> Navigating the user interface of the rich client to perform various activities, customization of Toolbars, Using My Work list, Teamcenter Mail and applications like Workflow Viewer to view and perform allocated tasks.	<b>8L</b>	<b>2S</b>
<b>02</b>	<b>Item and dataset creation</b> Create new items and datasets	<b>8L</b>	<b>2S</b>
<b>03</b>	<b>Structure creation</b> Create new structures combining various items, manage BOM using Revision Rules and Modular Variants	<b>8L</b>	<b>2S</b>
<b>04</b>	<b>Workflow assignment</b> Access workflow features to engage in the change management process	<b>8L</b>	<b>2S</b>
<b>05</b>	<b>Business objects</b> Viewing their properties, Create and manage default business objects like Item, Dataset, etc.	<b>8L</b>	<b>2S</b>
<b>06</b>	<b>Miscellaneous</b>	<b>8L</b>	<b>2S</b>

**Course: PLM ADMINISTRATION LAB**

<b>Course Code</b>	PGPLM7	<b>Scheme of Evaluation</b>	CE & ESE
<b>Teaching Plan</b>	0-0-4-0 = 4	<b>T1 &amp; T2</b>	20 Each
<b>Credits</b>	2	<b>ESE</b>	60

**Syllabus:**

<b>Unit No.</b>	<b>Content</b>	<b>Lecture</b>	<b>Self-study</b>
<b>01.</b>	<b>Setting up organization in Teamcenter</b> Defining the organizational structure like users, roles and groups in Teamcenter for executing the business process, Query Builder, organising the data based on the global standards, creating organization wide preferences, Defining projects and objects, miscellaneous tasks performed by the admin	<b>8L</b>	<b>2S</b>
<b>02</b>	Installation and configuration of database server (Oracle), Teamcenter 2-Tier installation, Rich client and BMIDE using Teamcenter Environment Manager (TEM), Teamcenter 4-Tier installation, Teamcenter active workstation installation, Using Over The Web (OTW) installer to load ICDs and install Web Tier, Distribution Server instance	<b>8L</b>	<b>2S</b>
<b>03</b>	<b>PLM Business Modeler Administration (BMIDE) Projects</b> Conceptualization and creation of a data model, Updating of existing data model	<b>8L</b>	<b>2S</b>
<b>04</b>	<b>Teamcenter PLM Server Side (ITK) Customization</b> create new data models and maintain them, writing new ITK utilities for data creation and modification, writing a DLL and integrating with Workflow designer using BMIDE & ITK	<b>8L</b>	<b>2S</b>
<b>05</b>	<b>PLM Client Side (RAC) Customization</b> Rich client stylesheet customization, Rich client plugin development, Teamcenter services- accessing SOA APIs, Services customization to extend the Teamcenter SOA solution	<b>8L</b>	<b>2S</b>
<b>06</b>	<b>Teamcenter PLM Active Workspace (AWC) Customization</b> Setup active workspace environment, Declarative commands, SOA access	<b>8L</b>	<b>2S</b>

**Course: PROJECT I**

<b>Course Code</b>	PGPLM8	<b>Scheme of Evaluation</b>	Report and Presentation
<b>Teaching Plan</b>	0-0-0-2 = 2	<b>Mid term review</b>	30
<b>Credits</b>	6	<b>ESE</b>	70

1. Apply knowledge and skills acquired throughout the program to a real-world PLM project.
2. Present findings and recommendations in the form of a detailed project report.

**Course: INDUSTRY PRACTICES AND PLM IMPLEMENTATION**

<b>Course Code</b>	PGPLM9	<b>Scheme of Evaluation</b>	CE & ESE
<b>Teaching Plan</b>	3-0-0-3 = 6	<b>T1 &amp; T2</b>	20 Each
<b>Credits</b>	3	<b>ESE</b>	60

**Course Objectives:** Upon completion of this course, students will be able to:

**Syllabus:**

<b>Unit No.</b>	<b>Content</b>	<b>Lecture</b>	<b>Self-study</b>
<b>01.</b>	Ongoing Industry practices and PLM Implementation	<b>6L</b>	<b>3S</b>
<b>02</b>	Ongoing Industry practices and PLM Implementation	<b>6L</b>	<b>2S</b>
<b>03</b>		<b>6L</b>	<b>2S</b>
<b>04</b>		<b>6L</b>	<b>2S</b>
<b>05</b>	Cloud based data base management AI for PLM	<b>6L</b>	<b>2S</b>
<b>06</b>		<b>6L</b>	<b>2S</b>

**Course: PROJECT II**

<b>Course Code</b>	PGPLM10	<b>Scheme of Evaluation</b>	Report and Presentation
<b>Teaching Plan</b>	0-0-0-8 = 8	<b>Mid term review</b>	30
<b>Credits</b>	15	<b>ESE</b>	70

1. Industry internship to gain practical experience in PLM implementation.
2. Collaborate with industry partners to solve a specific problem or optimize a product lifecycle.
3. Present findings and recommendations in the form of a detailed project report.