SHRI GURU GOBIND SINGHJI INSTITUTE OF ENGINEERING & TECHNOLOGY,
VISHNUPURI, NANDED
MECHANICAL ENGINEERING DEPARTMENT
M. Tech. (Mechanical – Product Lifecycle Management)
Academic Year 2014 - 15

Course Outline:

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<td>MMP-5111</td>
<td>PLM Fundamentals</td>
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**SEMESTER III AND IV**

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ELECTIVES:

**ELECTIVE – I**
- MMP-5141A Computer Aided Design
- MMP-5141B Lean Manufacturing
- MMP-5141C Total Quality Management

**ELECTIVE – II**
- MMP-5151A Finite Element Analysis
- MMP-5151B Supply Chain Management
- MMP-5151C Design For X

**ELECTIVE – III**
- MMP-5241A Project Management
- MMP-5241B Computer Aided Manufacturing
- MMP-5241C Assembly Planning and Management

**ELECTIVE – IV**
- MMP-5251A Digital Manufacturing
- MMP-5251B Enterprise Resources Planning
- MMP-5251C Reliability and Life Testing

Programme Structure and Credits

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MMP- 5111 PLM FUNDAMENTALS (PLMF)

Relevance of the course:
All industries that have tangible products need to understand PLM. Professionals who have responsibilities in engineering, manufacturing, or information systems or who have strategic planning responsibilities at the corporate or divisional levels will benefit from an understanding of PLM and its implementation.

Objectives of the course:

- To present the latest material on PLM and its importance in the organization.
- To provide an overview of the current thinking on the principles, strategies, practices, and applications of Product Lifecycle Management followed by an in-depth understanding of various applications and solutions PLM offered that are the focus of today’s innovative organizations.
- To build conceptual foundation of PLM, along with the latest industry views on PLM applications.
- To present frameworks which provide economic justifications for PLM projects and explain the pitfalls of a piecemeal approach to PLM.

Evaluation scheme:

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Course contents:

**Introduction:** Overview, Need, Benefits, Concept of Product Life Cycle, Components / Elements of PLM, Emergence and Significance of PLM, PLM implementation cases in various industry verticals.

**PLM Strategy and Vision:** Company’s PLM vision, PLM Strategy, Principles for PLM strategy, Preparing for the PLM strategy, Developing a PLM strategy, Strategy identification and selection, PLM business goals.


Human resources in product lifecycle, Methods, Techniques, Practices, Methodologies, Processes, System components in lifecycle, slicing and dicing the systems, Interfaces, Information Standards, Vendors of PLM Systems and Components.

**Text Books:**

**References**
- Relevant recent technical articles, research papers, key note addresses, etc.
NEW PRODUCT DESIGN (NPD)

Relevance of the course:
In this course the understanding of Product development process & methodologies are discussed along with types of design, importance of design, design considerations, product life cycle, technology life cycle, benchmarking and mass customization, stages, objectives and synchronized approaches in NPD. Prototyping with its basics helps to understand the functioning and visual look of product prior to its manufacturing with realistic examples. This course helps to solve the various case studies from automotive, aerospace, communication, etc. sectors.

Objective of the course:
- To provide conceptual understanding of product design, product development process & methodologies.
- To integrate product development process by identifying customer needs by gathering, interpreting, organizing and establishing relative importance of the customer needs.
- To highlight on complete design, justification and analysis (simulation), tool design, plan manufacturing, material and process selection, tools and software selection, testing (quality check) and servicing the product.
- To promote people for selecting and solving cases from various sectors with the help of product and process systemization, identification and solving methodologies, improving product development solutions.

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Course contents:

Introduction: Types of design, importance of design, design considerations, product life cycle, technology life cycle, benchmarking and mass customization, stages, objectives, success factors, concurrent approach in NPD

Product Development Process & Methodologies: Integrated Product development process - Identifying Customer Needs: Gather raw data from customers, interpret raw data in terms of customer needs, organize the needs into a hierarchy, establish the relative importance of the needs and reflect on the results and the process, Conceive – Specification, Concept design: the activities of concept generation, Concept Selection: Overview of methodology, concept screening, and concept scoring, Design - Detailed design, Validation and analysis (simulation), Tool design, Realize - Plan manufacturing: Factors influencing material and process selection, approaches, tools and software used in selection, Manufacture, Build/Assemble, Test (quality check), Service - Sell and Deliver, Use, Maintain and Support, Dispose.

Product Development Approaches: Bottom-up design, Top-down design, Front-loading design workflow, Design in context, Modular design. Concurrent engineering, partnership with supplier, collaborative and Internet based design, work structuring and team deployment, Product and process systemization, problem, identification and solving methodologies, improving product development solutions

Prototyping: Prototyping basics, principles of prototyping, technologies, planning for prototypes, practical examples

Cases: Select cases from automotive, aerospace, communication, etc. sectors

Reference Books:
- Chitale A. K. and Gupta R. C., Product Design and Manufacture, Prentice-Hall of India, New Delhi
MMP-513 | DATA MANAGEMENT (DM)

Relevance of the course:

Product Data Management (PDM) evolved into the now-a-days very popular Product Lifecycle Management (PLM) systems. Most of the CAD tools are marketed these days with in-built PDM systems. Design and manufacturing data is the core/heart of any industry’s engineering activities. To bring products into the market in least possible time and at the lowest possible cost has been the motto of industries since ancient days. PLM tools have shown the path to integrate /collaborate for achieving these goals. DBMS like Oracle, My SQL, DB2, etc form the backbone of PLM collaboration tools like Teamcenter, Winchill, Matrix, Enovia/Smarteam, etc.

Databases are part of every organization’s day to day activities. All fields of Mechanical/Production Engineering including engineering design, process planning, production planning and scheduling, shop floor management, MRP-1, MRP-2, ERP, SCM, sales and marketing, costing and estimation and manufacturing in general are flooded with management of a huge amount of data and its manipulation for running the day-to-day business activities. Information technology, Product data management and Product Lifecycle Management are keywords of successful operation of industries in the competitive global environment world over.

Objectives of the course:

- To create awareness about importance of databases in an Industry
- Introduction to use of tools like spreadsheets and database management software e.g. Oracle, MS Access, MS SQL, etc
- To make students learn database design concepts and issues.
- To make students understand and practice use of various models like E-R model and Relational models.
- To make students learn use of SQL for data definitions and manipulation.
- Advanced DBMS concepts including Distributed databases, Role of database in Enterprise systems like PDM / PLM.

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Course contents:

**Fundamental Concepts of Database Management:** Introduction to DBMS, Entity-Relationship model, Relational model, SQL concepts, Object-Based databases and XML, DBMS architectures, Distributed databases

**Product Data and Product Data Management:** Product Data, Product Data Management, Basic Functions of a PDM System, PDM Projects

**Data Models:** Metamodels and Company Models; Basic Data Modelling Concepts like Objects and Types, Attributes, Relations; Products: Product Structures, Configurable Products; Documents, Versioning: Revisions, Version Trees and Graphs, Variants, Configurable Documents, Revisions and Variants Combined, Component Versions, Configurable Products and Versions


**PDM Standards:** STEP Standard: Express Language, External Representation of EXPRESS Data, Integrated Resources, Application Protocols, STEP and Generic Product Structures; Component and Supplier Management
Text Books:


- Software documentation of Oracle, MS Access, Visual FoxPro, SQL server, MySQL, MS Excel.
MMP-5141A COMPUTER AIDED DESIGN (CAD)

Relevance of Course

CAD is an important industrial art extensively used in many applications, including automotive, shipbuilding, and aerospace industries, industrial and architectural design, Biomedical engineering, and many more. CAD is a part of the whole Digital Product Development (DPD) activity within the Product Lifecycle Management (PLM) process. Being the first and core activity, understanding of the subject helps study other downstream applications. Hence, it is equally useful for both M. Tech. courses in Mechanical CAD/CAM and PLM.

Objectives of Course

To understand use of computers in design process
To study the mathematical representation of surfaces and curves used in geometric modeling
To study facilities in different CAD Software
To study theory of solid modeling techniques
To study the basics of graphics programming required for CAD software development.

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Course contents:

Product design process: Importance of design, design process, technological innovation and the design process, Team behavior and tools; Embodiment design: Product architecture, configuration of design, parametric design, Industrial design, Human factors design, Design for X (DFX)

CAD – Introduction, Role of CAD, CAD system architecture, Hardware and software for CAD, Software modules, ICG, Graphics Software, Ground rules for design of GS, functions of GS, modeling and simulation, Solid modeling methods

An overview of modeling software like UG/NX, Solid Works, Autodesk Inventor, Professional, AutoCAD, PRO/E, CATIA: Capabilities, Modules, Coordinate systems, Sketching tools, solid modeling tools, surface modeling tools, expression/parameters toolbox, data exchange tools, API and customization facilities

Geometric transformations: 2D and 3D, transformations of geometric models like translation, scaling, rotation, reflection, shear; homogeneous representations, concatenated representation; Orthographic projections

CAD/CAM Data exchange and data storage: Introduction, graphics and computing standards, data exchange standards like IGES, STEP, Model storage - Data structures - Data base considerations - Object oriented representations - Organizing data for CIM applications - Design information system

Mathematical representations of solids: Fundamentals, Solid models, Classification of methods of representations, half spaces, boundary representation, CSG, sweep representations, Octree representations, primitive instancing, cell decomposition, spatial occupancy enumeration

Mathematical representations of curves and surfaces: Curve representation, parametric representation of analytic and synthetic curves; Surface models, Surface representations, parametric representation of analytic and synthetic surfaces

Assembly modeling: Representation, mating conditions, representation schemes, generation of assembling sequences

Visualization, Multi CAD system (JT etc.), how to manage non-geometric data for eg. Visualization data, light weight representations techniques such as tessellation / voxelization their motivation, how visual representation can be obtained from tessellated, voxelized data, reverse engineering, evolution
AI approaches and applications in CAD, Knowledge Based Engineering, OpenGL, Introduction to Advanced visualization topics in CAD like Modern representation schemes like FBM, PM, Feature recognition, Design by features, Tolerance modeling, System customization and design automation, Open Source CAD like Open CASCADE

Text Books

- **Software Documentation, tutorials, manuals of following software namely** UG/NX, Solid Works, CATIA, Autodesk Inventor Professional, AutoCAD, Open CASCADE, ANSYS Design modeler, Pro/E
MMP-5141B LEAN MANUFACTURING (LM)

Relevance of the course:

In this subject the understanding and reimbursement of the lean manufacturing system is discussed along with (Just In Time) JIT production system. The subject emphasizes on waste elimination technique which can be widely implemented in any manufacturing and mass production industry. The general idea of Kanban system can help to counter problems & dealings of both suppliers and contractors. Shortening of production lead times along with set up time reduction helps for standardization of operations. Elements of lean production system help to manage lean enterprise as a career ladder.

Objective of the course:

• To provide conceptual understanding of JIT Logic along with Pull and Push production system.
• Implementation of JIT principles to waste elimination along with understanding of Japanese approaches.
• To emphasis on Kanban system to counter problems & dealings of both suppliers and contractors with the help of related Kanban cards.
• To make understanding of the rise of lean production along with birthplace, concrete example, company as community, final assembly plant, product development and engineering, changing customer demand and future of lean production.
• To promote people for creating an organization and installing business system to encourage lean thinking

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Course contents:

**Introduction to Lean Manufacturing:** Production System and its types, Transition to Lean, Lean Thinking, Manufacturing Strategies, Benefits of Lean Manufacturing

**Elements of Lean Manufacturing:** Elimination of Waste, Value Stream Mapping, 5S, Kaizen Approach, Introduction to and comparative study of Toyota Production System, Total Productive Maintenance, Total Quality Management and Six Sigma, Lean Indicators and Organizational Performance

**Cellular Manufacturing:** Layouts, Group Technology - part families, clustering methods - Rank Order Clustering, Single-Pass Heuristic considering Capacities (Askin and Standridge), Clustering using Similarity Coefficients, Production Flow Analysis, Utility Layout

**Just In Time Production System:** JIT Philosophy, JIT implementation requirements, Production Smoothening – philosophy and methods, Pull system - Production Authorization, Kanban Systems, scheduling Kanban production, CONWIP system, Base Stock System, Inventory Management in JIT, Information Management in JIT

**Shortening of Production Lead Times:** Reduction of setup times, practical procedures for reducing setup time, Transfer Lots, Economic implications of setup time reduction, Standardization of operations, multi function workers and job rotation

**Human Approach for Lean Implementation:** Lean Leadership, Total Employment Involvement, Small Group Activities like Quality Circles, SMTs, etc.

**Scheduling:** Scheduling System Requirements, Bottleneck Scheduling, Single Machine Scheduling, Flow Shop Scheduling, Job Shop Scheduling
Text Books

- **Chasel Aquilino**, “Productions and Operations Management”
- **James Womack**, “Lean Thinking”.
MMP-5141C  TOTAL QUALITY MANAGEMENT (TQM)

Relevance of the course:

Every organization strives to have a competitive advantage over others. Strategies for competitive advantage need effective management. The strategies, tools and techniques that shall be studied in this course can help provide the student with the knowledge of broad spectrum of operations management approaches. A student who masters this subject can be a very valuable asset for any industry.

Course Objectives:

- To understand fundamentals of Customer satisfaction.
- To study philosophies of total quality management by renown quality gurus.
- To study various quality related costs.
- To study the scientific tools for quality improvement.
- Introduction to off-line quality control for quality improvement.
- To study the contemporary quality assurance standards.

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Assessment Of Quality Cost: Objectives, Cost of poor quality, Quality cost classification, Analysis of quality cost, hidden quality costs, Economic models of quality cost, guidelines to establish and cut down quality cost.


Off Line Quality Control: Robust design, Loss function, Taguchi’s recommended design techniques, O.A., Linear graphs, Taguchi’s analysis techniques, performance measures S/N ratios, parameter design, inner and outer arrays.

Design and Analysis of Experiments: Factorial experiments, Analysis of variance, Analysis of means.


References Books:

2. Total Quality Management – Logothetis
3. Total Quality Management – Banks
4. Fundamentals of Quality Control and Improvement – Amitava Mitra Pearson Education Inc.
5. Total Quality Control Essentials - Sarv Singh Soin - McGraw Hill Ltd.
6. Quality Circles Master Guide- Sud Ingle (PHI Publication)


8. QFD linking a company with its customers- Ronald G. Day - McGraw Hill Ltd.

9. The complete ISO Manual - Denniss Green

10. Relevant recent technical articles, research papers, key note addresses, etc.
MMP-5151C  FINITE ELEMENT ANALYSIS (FEA)

Relevance of the subject: The objective of this subject is to teach numerical method like finite element analysis, which are used in the industries extensively. The topics on shape functions, element formulation, assembly procedure, and solution techniques help understand commercial FEA softwares and its effective utilization. The subject improves the problem solving capabilities and useful for research in future.

Objectives:

To improve the problem solving ability using numerical method like FEA. To understand and use the commercial finite element packages effectively through hands on practice in the laboratory.

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Course contents:

**Introduction to Finite Element Method:** Basic Concept, Historical Background, Engineering applications, general Description, comparison with other methods.


**Finite Element Techniques:** Applications to solid and structural mechanics problems: External and internal equilibrium equations, one-dimensional stress-strain relations, plane stress and strain problems, axis symmetric and three dimensional stress strain problems, strain displacement relations, boundary conditions compatibility equations, analysis of trusses, frames and solid of revolution, computer programs. Applications to heat transfer problems: Variational approach, Galerikn approach, one dimensional and two dimensional steady state problems for conduction, convection and radiation, transient problems.

**Parameters affecting Accuracy of the FEA results:** How to validate and check accuracy of FEA results? Computational accuracy: strain energy norm, residuals, Reaction forces and moments; convergence test, Average and unaverage stress difference. Correlation with actual testing: strain gauging-stress comparison; natural frequency comparison; Dynamic response comparison, temperature and pressure distribution comparison.

**Text Books:**

- **T. J. R. Hughes,** The Finite Element Method: Linear Static and Dynamic Finite Element Analysis, Dover Publications, 2000
- **Chandrupatala and Belegundu,** Introduction to Finite Elements in Engineering. Prentice Hall India, 2003
MMP-5151B SUPPLY CHAIN MANAGEMENT (SCM)

Relevance of the Course:
As a PLM Professional the students should know the relation between the different concepts and related technologies such as SUPPLY CHAIN MANAGEMENT and CRM with PLM. As industries are looking to take advantage of all such technical and technologies to have the competitive advantage in product development process.

Objectives:
• To develop an understanding of key drivers of supply chain performance and their inter-relationships with strategy and other functions of the company such as marketing, manufacturing and accounting.
• To impart analytical and problem solving skills necessary to develop solutions for a variety of supply chain management and design problems and develop an understanding for use of information technology in supply chain optimization.
• To understand the complexity of inter-firm and intra-firm coordination in implementing programs such as e-collaboration, quick response, jointly managed inventories and strategic alliances.
• To develop the ability to design logistics systems and formulate integrated supply chain strategy, so that all components are not only internally synchronized but also tuned to fit corporate strategy, competitive realities and market needs.
• To understand which information should be exchanged in a supply chain and how it should be used to benefit the entire supply chain.
• To identify improvement opportunities that exist within supply chains in different industries and to quantify the improvements that various supply chain strategies offer.
• To understand which barriers companies face during the implementation of new supply chain strategies.

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Course contents:

**Logistics and Competitive Strategy:** Competitive advantage – gaining competitive advantage through logistics – mission of logistics management – supply chain and competitive performance – changing logistics environment, supply chain management and the PLM ecosystem.

**Customer Service Dimension:** marketing and logistics interface – customer service and customer retention – service driven logistics systems – setting customer service priorities – setting service standards.

**Measuring Logistics Cost and Performance:** concept of total cost analysis – principles of logistics costing – logistics and the bottom line – logistics and shareholder value – customer profitability analysis – direct product profitability – cost drivers and activity-based costing.

**Benchmarking the Supply Chain:** benchmarking the logistics process – mapping supply chain processes – supplier and distribution benchmarking – setting benchmarking priorities – identifying logistics performance indicators.

Managing the global pipeline: trend towards globalization in the supply chain – challenge of global logistics – organizing for global logistics.

**Strategic Lead-Time Management:** time based competition – concept of lead-time – logistics pipeline management – logistics value engineering – lead-time gap.

**Managing the Supply Chain:** creating logistics vision – problems with conventional organizations – developing logistics organizations - logistics as a vehicle for change – need for integration – managing supply chain as a network – process integration and ECR – co-makership and logistics partnerships – supplier development.

**Role of Information Systems and Technology in SCM:** importance of information in an integrated SCM environment – inter organisational information systems (IOIS) – information requirements determination for a supply chain IOIS – information and technology applications of SCM.

**Developing and Maintaining Supply Chain Relationships:** conceptual model of alliance development – developing a trusting relationship with partners in supply chain – resolving conflicts in supply chain relationship.

**Cases in SCM:** Future Challenges in SCM: greening of supply chain – design for SCM – intelligent information systems.

**Text Books**

- **B S Sahay,** Supply Chain Management for Global Competitiveness, Macmillan India Ltd., New Delhi, 2000.
Relevance of course:

It is well received that complete technical knowledge and step-wise operations during the design/manufacturing/services are needed to be aware about before the process is put to automation. Computer application through automation has becoming an important issue in each of the phases of product life cycle and production cycle. Therefore, the course is aimed to provide the necessary information and fresh up the fundamental knowledge in context of automation.

Objective:

In view of automation system development for different stages in product life cycle, the course DF”X” aims with the following objectives:

To understand the DF”X” procedures and preview with respect to product life cycle.
DF”X” tools used and their functions are aware of for its implementation in concurrent engineering approach.
Students should be able to apply the learnings for Design for: Assembly, Disassembly, Reliability, Heat Treatment, Technical Merit, Assorted technical requirements/processes etc.

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Course contents:

Introduction: Need, evolution, fundamentals and usages of DFX, Performance characteristics and tool kits for DFX, Development and Implementation of DFX tools.


Design for assorted technical requirements/processes: Material storage and distribution, Dimensional control, Heat treatment, Coating Casting, Plastic processes like wise.

Design for Life Cycle: Approaches to product development, Inspectability, Serviceability.

Design for Reliability, Quality: Approaches, QFD, Evaluations and Procedures.


Text Books:

- Assembly Automation and Product Design, Geoffrey Boothroyd, Marcel Dekker, Inc,
- Design For Manufacturing: A Structured Approach, Corrado Poli, Butterworth Heinemann
- Process selection from Design to Manufacturing, Swift and Booker, Butterworth Heinemann
MMP-5161 PLM LAB-I

Relevance of the course:
Today industries are developing their products in short span of time, for that they are using software and tools such as CAD/CAE/CAM and PLM/ PDM. Through this course, students will have interface and practice with this type of software and tools.

Objectives of the course:
To study PLM software installation procedures and their architectures
To study prerequisites of PLM
To learn working of components of PLM software
To study implementation procedures of PLM
To build CAD, CAE Model using any CAD and CAE software and integrate it with PLM software

Evaluation scheme:

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Course contents:


CAD: Modeling (at least 5 parts) and Assembly using any High End CAD Software.
Assembly should include top down and bottom-up approaches, Drafting (at least 1 assembly).
CAD File/data exchange amongst the various CAD software and software for CMM, CAE, CNC, CAM

FEA: Analysis (structural, thermal and both )of at least two parts, Introduction to nonlinear analysis

PLM: Exhibiting use of following modules of any PLM software through at least six assignments
  - Organization
  - Workflow
  - Product Structure
  - Access Manager
  - Query Builder
  - Change Management
  - Schedule Manager
  - Manufacturing Process Planner
M. TECH. (Mechanical - PLM)

MMP-5161 PROGRAMMING LAB

Relevance:
PLM engineers are required to understand and customize the PLM software for various applications and specific customer need, requirements. Therefore programming skills for customization of either the server or clients or the other middleware are essential.

Objectives:
Develop understanding and skills of the following,
- C, C++ programming and related Integrated Development Environments (IDEs)
- Java programming and related IDEs

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Course contents:
Study of Programming in following languages:
- C++ using following IDEs,
  - Visual C++ (Visual Studio 2008 or Later)
- JAVA using JDK
  - OOP using Java, Inheritance, inner classes, Interfaces
  - AWT (Abstract Windowing Toolkit)/Swing: Applets, Applications and event handling
  - SWT
  - Filing and printing documents
  - Networking with Java
  - Java and XML, Images and animations, talking to databases, JDBC

At least six programming assignment on C++ and Java

Text Books / Documentation:
1. Holzner Steven, Java 2 Programming Black Book, Dreamtech Publishers
2. Savitch, Java Programming
4. Herbert Schildt, OOP with C++
MMP-5181 DATA MANAGEMENT LAB

Relevance:
PLM engineers are required to understand how the data is being managed, stored and retrieved from the database for various applications and specific customer needs, requirements. Therefore, having skills of use of various DBMS packages and programming skills in DBMS packages are essential.

Objectives:
Develop understanding and skills of the following,

- To install and use DBMS software
- To create tables and databases
- To make students understand and practice use of various models like E-R model and Relational models.
- Study and use DBMS packages like Oracle/ MS SQL Server/ Visual FoxPro / MS Access/ My SQL
- Programming in DBMS packages using SQL

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Course contents:

Study of DBMS
DBMS Software: Oracle/ MS SQL Server/ Visual FoxPro / MS Access/ My SQL

Installation and overview of the DBMS Software

Use PL/SQL – For Table definition/creation and modification, using tables, insertion and modification of data, manipulating data, sorting data, displaying data from multiple tables, sub-queries, constraints, creating views, controlling user access, triggers

Queries to be implemented on DBMS using SQL including and not limited to

- Data Definition and Data Manipulation language,
- Relational operators (= ,<,>,etc.),
- SQL operators (Between…, AND, IN(List), Like, ISNULL, negating expressions ),
- Character, number, date and group functions,
- Relational Algebra (UNION, INTERSECT, and MINUS, etc.),
- Extracting data from more than one table (Equi-Join, Non-Equi-Join , Outer Join),
- Sub queries, nested queries,
- PL/SQL Programming.

Concepts for Roll Back, Commit and Check Points
Create Views, Cursors, and Triggers and Write Assertions
Create Forms and Reports.

Micro/Mini Project to be carried out throughout the semester to understand the above mentioned concepts of Database management.
Text Books / Documentation:

1. Date C J, “An Introduction To Database System”, Addison Wesley
6. Majumdar and Bhattacharya, “Database Management System”, TMH
8. Oracle documentation,
   a. Oracle 9i Introduction to SQL Part I and II
   b. Performance tuning Vol. I and II
   c. Oracle Application development guide and other necessary documents
MMP-5191 SEMINAR-I

Relevance of the course:
Seminar gives opportunity to students to represent their skills and increases their interest towards research work.

Objectives of the course:
To study different types of recent technical research papers.
To learn to make technical seminar reports and presentations
To increase the presentation skills

Evaluation scheme:

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Contents:
The seminar shall consist of study of a particular topic based on 4-6 research papers or case study of 1/2 industries. The internal marks shall be awarded as the basis of performance of the individual student during his/her seminar presentation. Each student is also required to submit a report based on above study in the prescribed format.
MMP-5211 PLM: ADVANCE CONCEPT (PLM-AC)

Relevance of the course:
This course will train the students so that they can work with latest technologies such as PLM/PDM, by going through this course they will be able to implement and develop such systems also which is the growing need of the industries today to have competitive edge.

Objectives of the course:
In this course the students will come to know global change management, Legacy System Integration & data transfer, product architecture, and CAD BOM alignment.

This course also has the terms and technologies such as workflow, product structuring visualization of data, architectures of PLM and students can work with PLM systems directly.

Integration of PLM systems with other systems.

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Course contents:
Multisite, Global Change Management System (GTS), Legacy System Integration, Legacy Data Transfer, Security in PLM (SSO/SSL etc).

Product master management (managing the deployment of the finished design into the production environment), product architecture (Functional architecture, Physical architecture etc), understanding business object, CAD-BOM alignment, security services, PLM localization, Business modeling, classification structure, PLM System Architecture (2tier/3tier/4tier etc) Managing Changes and Workflows, Classifying Data, Managing Documents, Reports, Requirements, and Schedules, Sharing Data, Managing Product Structures, Managing Manufacturing Data, Managing Mechatronics Data, Visualizing Products, Managing CAE Data, Repeatable Digital Validation, Managing Quality Data, Managing Maintenance, Repair, and Overhaul Data.

Product Data: Data objects to represent product data, such as parts, assemblies, processes, product changes, requirements, and specifications, Simple parts (with JT /with CAD /with CAD+JT/ with CAD + drawing / with CAD + JT + drawing + other documents), Simple assembly, multilevel assembly, Hybrid assembly, concurrency in data transfer (replica transfer/delta transfer/re-export), collision

Concepts of Product Structure management such as Configurations, Multi CAD Integrations, issues involved, data management of heterogeneous CAD systems, management of product data interfaces, GD&T, annotations, manufacturing notes, Integration of CAM with PLM.

PLM Implementation: Activities Involved under various phases of PLM implementation like Pre-Align, Align, Plan, Build, Test, Deploy and Close. Project Planning, Documentation and Deliverables involved.

Text Books:

References
Relevant recent technical articles, research papers, key note addresses, etc.
WEB AND NETWORKING TECHNOLOGIES (W&NT)

Relevance to industry:
Collaborative product design and concurrent engineering is a reality today due to the availability of networking environment. Internet usage is increasing day by day and Web based engineering tools are a part of everyone's desktops now-a-days.

Objectives of the course:
To study web engineering skills
To develop skills in networking related issues and programming and software
Learn XML, HTML

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Course contents:
Web: History of Web application, W3C, Introduction to various web building technologies.

Mark up languages: Use of markup languages in building web applications, Hypertext Markup language (HTML), (Extensible mark-up Language) XML,

XML Parsers: What is parsing, Types of parsers, benefits and limitations of each parser.

RMI and networking: Introduction to Remote Method Invocation (RMI), Importance of RMI in web applications

J2EE technologies:
JSP- What is JSP, JSP architecture, Session in JSP, Cookies and use of cookies. Servlet- Introduction to Servlet technology, web container, Methods of Servlet, Lifecycle of a servlet, advantages of servlet, HTTP session listener and filters in servlet.

EJB3- Introduction to Application server, Features of enterprise beans, benefits of EJB, Annotations, Introduction to POJO, stateless and stateful session beans.

Ajax- Introduction to framework, rule of ajax in enhancing user experience, ajax examples.

Distributed Computing Concepts of Client-Server Architecture (2-Tier, 4-Tier, n-Tier), Design aspects, Technologies (.NET, J2EE)

Security: Computer network security, data security, issues, techniques involved, known practices, multisite configurations, issues,

Introduction to Hibernate and JSF

Text Books:
- David Hunter et al, "Beginning XML"
- XML - O'Reilly Media
- Jennifer Niederst, Learning Web Design 2nd Edition
- Elizabeth Castro, HTML for the World Wide Web
- Rod Johnson, Expert One-on-One J2EE Design and Development
MMP-5231 CUSTOMIZATION OF PLM SOFTWARE (CPLMS)

Relevance of the Course:
LPG related policies of the Government world over have increased the demand for digital engineering services with a broad number of new engineering technologies
Ranging from Data Exchange Service to CAD data Designing and Modeling Service, CAE Analysis and simulation, CAD Data Conversion Service, PLM solution and Outsourcing Services
CAD /CAM/CAE/PLM companies providing these services work with vision to bring over innovative technologies and unique solutions to help organizations grow competitively. They provide value added solution and services in the area of new engineering technologies.
Most PLM software is designed with features that may not be suitable to the customer’s day to day specific /specialized needs. Many industries provide system customization services, to design solutions according to custom requirements and business need, making the work and life easier.
The course is aimed to enable students understand customization concepts and develop skills related to customization of PLM software.

Objectives of the Course:
  a. Understand rapid development concepts, SDLC and Prototyping
  b. Learn to add more features and functions in the existing PLM software tools
  c. Study user interface customization, e.g. Icon/ menu, naming and arrangement.
  d. Study and develop PLM Software customization skills.

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Course Contents:
Introduction to customization, need, types; introduction, Basic customization concepts, common customization tasks, software engineering concept; Software Development Life Cycle (SDLC), Requirement analysis, Rapid application Development (RAD) tools, programming languages. Customization of World processing and spreadsheet tools

PLM Software Data & Application Modeling: Data and Application Modeling Interface like View, Perspective, Menu usage, connection, Overview, Codeless and Codeful customization of Data and Application Modeling.

Server Side Customization: Understanding Server Side API, Finding APIs for your needs, writing new APIs, Samples, Call Server Side Program/Code from the Client Side Environment.

Client Side Customization: Client Side Platform, Client Side Non programming customization Client Side customization environment setup, Basics Client Side Plug –in, Overriding Command, Adding menu command to a menu, toolbar and shortcut menu; Client Side –UI form introduction

Service Based Customization: Basic of Service based framework, Using Existing Service based API, Writing new Service API, Calling API through rich client and thin client.

References:
  a) PLM Software Customization Documentation /Help Manuals,
  b) Getting started with Customization,
  c) Client Side Customization- Programmer’s Guide,
  d) Integration Toolkit Programmer’s Guide
  e) Data & Application Modeling Guide,
  f) Application interface Web Service (AIWS) configuration and customization Guide.
MMP-5241A PROJECT MANAGEMENT (PM)

Relevance to industry: The course is relevant as product developments are carried out as projects.

The software industry has specific application of this course as software developments are time phased tasks and software project management helps a lot towards timely completion and testing of software’s.

Objectives:
To inculcate the knowledge that is required to implement various projects.

It develops the vision for identification and formulation of the projects.

Various tools and techniques which are essential for smoother execution of projects are to taught in the course.

Succinctly, this course imparts the knowledge that can be applied to optimize time and resources in project implementation.

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Course contents:

Introduction to PM: Projects in Contemporary Organization, Project Life Cycle


Text Books

- UNIDO Series on Project Management
**MMP-5241B COMPUTER AIDED MANUFACTURING (CAM)**

**Relevance of the course:**

CAM is the use of a computer to assist in all operations of a manufacturing plant, including planning, management, transportation and storage. Its primary purpose is to create a faster production process. Now days in Industry various manufacturing systems are utilized such as CIM, FMS, GT, CAPP, etc.

**Objectives:**

The syllabus of this course is framed to teach modern aspects of manufacturing. CAM part deals with machines with increasing levels of computerization, along with required coding skill to operate these machines. Some concepts of general layouts that are used for automation, like production flow analysis, algorithms for material flow optimization, are also important and to learn different types of rapid prototyping techniques.

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**Course contents:**


Computer Aided Production Planning and Control: Process Planning: Variant and Generative systems, Aggregate production planning and master production schedule, MRP, MRP II, Capacity planning, Shop Floor Control


Introduction to Computer Aided Inspection: Coordinate Measuring Machine and its operations

**Text Books**

- David Bed worth, Computer Integrated Design and Manufacturing, TMH, 1998
**Relevance of the course:**

Assembly, as the final production stage, must cope with continuously shifting market requirements in regard to timing, batch sizes and product design or style, thus making it sensitive to any changes and requiring a flexibility that is not always possible. Assembly is known to have an important share in both the manufacturing lead time and resources used for production and is, therefore, an important candidate in the attempt to reduce them. A shift in the research focus on assembly in the last two decades is evident from the huge amount of research articles. However, there has been almost no movement in the academics towards including a course on assembly at under-graduate or post-graduate level. Introduction of this course is an attempt to make students aware of the importance of assembly systems and intrigue them into studying, analyzing and designing assembly systems which represent a very complex and interesting area of study.

**Objectives of the course:**

- To gain an understanding and interest in the assembly line design practices prevalent in industry.
- To gain ability to recognize situations in an assembly system environment those suggest the use of certain quantitative methods to assist in decision making.
- To learn how to think about, approach, analyze, and solve assembly system problems using people skills (predominantly) and technology.
- To increase knowledge and broaden perspective of the "industrial world" in which one will contribute his / her talent and leadership as an Industrial Engineer.

**Evaluation scheme:**

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**Course Contents:**

**Introduction:** Assembling a product, manual and automatic assembly, robotic assembly, Liaison diagram, assembly process, key characteristics of assembly, variation risk and its management.

**Assembly Sequence Planning:** Introduction, assembly sequence design process, Bourjault method of generating all feasible sequences, cutest method, stability of subassemblies, softwares

**Assembly Line Design:** Process of Assembly Line Design (ALD), components of ALD, consideration of equipments, buffers, etc. Introduction to assembly line balancing and defining assembly line balancing problem using precedence diagrams.

**Simple Assembly Line Balancing Problem (SALBP):** Performance Characteristics, types of SALBP, optimal solution methods for SALBP, heuristics and meta-heuristics, introduction to Genetic Algorithm, applying simple genetic algorithmic approach to SALBP.

**Generalized Assembly Line Balancing Problem (GALBP):** Considerations leading to GALBP, formulation and solution approaches for a few types of GALBP such as assignment restrictions, mixed model ALBP, U-line ALBP, parallelization, etc.

**Reconfiguration:** Need and importance of reconfiguration / rebalancing, approaches for reconfiguration.

**Text Books and References**

- Daniel E. Whitney, Mechanical Assemblies, Oxford University Press, 2004
Relevant Research Papers such as and not limited to:


MMP-5251A DIGITAL MANUFACTURING

Relevance of course:

Manufacturing the product with shortest time is the aim of the today’s industries to satisfy customers need so the related technologies are needed to be studied, this course teaches about digitization in manufacturing and to achieve the objectives of PLM.

Objectives:

- To understand the challenges faced by manufacturing
- To understand the importance of digital manufacturing for business processes
- To understand the importance of DM in PLM
- To understand digital manufacturing and its advantages
- To understand and develop the digital work environment
- To be proficient in using computer-aided technology to support the above.
- To appreciate the need of DM for the Indian manufacturing industry.
- To align with the objectives of the PLM course.

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Course contents:


Process simulation and validation: Assembly and component manufacturing, process simulation and validation, Ergonomic/ human simulation, Robotic simulation and OLP

Plant design, simulation & optimisation: Station / work-cell layout design, Throughput simulation, Discrete event simulation, Optimisation of material flow and logistic

Manufacturing process simulation solution customisation: Functionality enhancements as extensions of OOTB software solution, Reports customisation, User interface customisation

Special Topics: Informatics platform for designing and deploying e-manufacturing systems, framework for integrated design of Mechatronic systems, Collaborative supplier integration for product design and development. Reconfigurable manufacturing systems design, Virtual Reality based platform for collaborative product review and customisation, Managing collaborative process planning activities through extended enterprise, rapid product development, desktop assembly factories, Information sharing in digital manufacturing based on STEP and XML

Text Books:

MMP-5251E ENTERPRISE RESOURCE PLANNING (ERP)

Relevance to industry:
In the product life cycle data sharing management is the key issue in the industries so through this course students should know different skills and concept for that such as ERP of data management

Objectives:
- Describe the concept of ERP and the ERP model; define key terms; explain the transition from MRP to ERP; identify the levels of ERP maturity.
- Describe the elements of a value chain, and explain how core processes relate; identify how the organizational infrastructure supports core business processes; explain the effect of a new product launch on the three core business processes.
- Identify the international issues that impact a worldwide implementation of ERP; identify the key technological considerations and infrastructure concerns in ERP implementation; describe the strategic use of technology for ERP.
- Explain how the key elements of organizational change management apply to an ERP implementation; define change readiness; describe a learning requirements plan; explain the use of assessment tools to identify the readiness of an organization to change; identify the methods of implementing and sustaining the change.
- Describe project organizational considerations; define the project management tools and resources needed to implement an ERP system; describe the roles and responsibilities of the key organization players; describe the tactics, tools, and methodologies available to implement ERP; evaluate the success of the implementation.
- Describe how the knowledge management capability of an ERP system can be used to sustain competitive advantage; describe how to use ERP to communicate effectively with customers and suppliers.

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Course contents:
**Introduction to ERP:** Introduction, Evolution of ERP, Reasons for growth of ERP, Advantages / disadvantages of ERP, Evaluation of ERP, Various Modules in ERP

**Modules in ERP:** Finance and Controlling, Sales and Distribution, Materials Management, Production Planning and Control, Quality Management, Planet Maintenance, Human Resource

**Business Processes:** Order To Cash, Procure To Pay, Plan To Produce, Make To Stock, Make To Order and Assemble To Order, Difference in Discrete and Process industries

**Manufacturing Process Knowledge:** Auto Industry, Hi Tech, FMCG, Pharma and Chemical

**ERP Projects:** Project types, Implementation methodology, Various steps in the project Implementation, Project Preparation, Business Blueprinting, As Is – To Be Study, Gap Analysis, Realization, Final Preparation, Go Live and Support, User Training, Issues during implementation

**ERP and Related technologies:** Business Process Re – engineering, MIS, Executive Information System, Decision Support System

**ERP Market:** ERP packages like SAP, BAAN, Oracle Apps, JD Edwards, Comparison Study, Evaluation and Selection

**Future Directions in ERP:** Current trends in ERP, Changes in the ERP Implementations, Faster implementation methodologies, Web enabling

Integration of ERP with SCM, SRM, CRM and PLM., system architecture, landscape and licensing
Reference Books / Learning Material

- V.K. Garg & N.K. Venkitakrishnan, ERP Ware: ERP Implementation framework
- Alexis Leon, Enterprise Resource Planning
- Rahul Altekar, Enterprise Resource Planning
- APIC’s material on ERP
MMP-5251C RELIABILITY ENGINEERING & LIFE TESTING (RE&LT)

Relevance to industry: The course is relevant as customer satisfaction depends on product performance for the said purpose. Reliability analysis helps improve the reliability of any product or system which ultimately maintains the customers’ base of any industry.

Objectives: The aim of this course is to understand various components or products or systems through its life cycle. The course helps perform the probabilistic time analysis of products’ successes and failures. Thus the course helps to predict reliability of any component or system which is essential before we put it into any use.

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Course contents:

Basic concepts in Reliability: Risk and Reliability, Bath tub curve, Failure Mechanism of mechanical components: causes, modes, function of mechanical elements, failure theories.

Component Reliability: Failure data analysis, reliability function, hazard rate, failure rate, and their relationship, MTTF, mean failure rate, MTBF.


System Reliability Improvement: use of better components, simplification, derating, redundancy, working environment control, maintenance, etc. Redundancy Techniques: Introduction, component vs unit redundancy, weakest link technique, mixed redundancy, standby redundancy, redundancy optimization, double failure and redundancy.

Case Application of complex systems: Marine power plant, computer system, Nuclear power plant, combats aircraft, etc.


Acetated Life Cycle Testing: Intro, basic concepts, data qualification. Accusations faster, stress combination methods, limitations, step stress method for AST, various AST models, recent development recommended approach. Highly accelerated life testing (HALT), HASS

Self Learning Component Through Sessionals: Case application, assignments, subject paper/project, presentation etc.

Text Books:

- E. Balagurusamy, Reliability Engineering, TMH, New Delhi.
MMP- 5261 PLM LAB-II

Relevance of the course:
Data management is the key issue for the OEM and designers, so through this course student will develop this skill which will enhance their ability to develop and implement software for the same.

Objectives of the course:
To study functions of the PDM.
To study working of different Modules of PLM.
To study integration of PLM with different software.

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Course contents:

**PDM Functions** - Workflow Management, Project Management, Search Management,

**Product Lifecycle Management (PLM) Concept and Special Functions** - Creating Organization (Users, Roles, Group, Volume etc), Defining rights (Object/Rule Based), Creating required hierarchy of folders, item, form, dataset types, Defining business model Customizing different queries and reports out of the box, Creating different workflows, Creating and managing engineering change, Adding custom attribute to forms / in class, Creating different BOM view (PSE), Resource classification.

**CAD Integration** - CAD Manager/ Embedded Client, Seed/Template Creation, Attribute Mappings – NX3, AutoCAD, Solid Edge, PDM Functionalities Mappings (Setting Customer Options etc)

**Sample Data Migration** - Removing Broken Links and Duplicates, Associated Files (TIFF, CGM etc), Attribute Mappings, Define Search File, Define Map File, Importing Data

MMP-5271 WEB AND NETWORKING TECHNOLOGIES LAB

Relevance of course:
Collaborative product design and concurrent engineering is a reality today due to the availability of networking environment. Internet usage is increasing day by day and Web based engineering tools are a part of everyone’s desktops now-a-days.

Objectives of the course:
- To study web engineering skills
- To develop skills in networking related issues and programming and software
- Learn XML, HTML

Evaluation scheme:

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Component</th>
<th>Weightage (%)</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Continuous evaluation</td>
<td>100</td>
</tr>
</tbody>
</table>

Course contents:
Practicals on: XML, HTML, SAX and DOM parsing examples, JSP, database connectivity using JSP, Servlet, database connectivity using Servlet, EJB3.1 examples, database connectivity using EJB, Ajax.
Relevance of the Course:

This program is designed for student who are willing to get transformed to successful PLM professional by exploring PLM Software Usage, Administration, Installation & Integration along with Server & Client customization at its depth.

The course is aimed to enable students understand customization concepts and develop skills related to customization of PLM software.

Objectives of the Course:

- To study data creation, usage, dissemination and process management
- To study PLM Software Application and Data Model Administration
- To study PLM Software Installation and Integration
- To study PLM Software Server and Client Customization

Evaluation scheme:

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<tbody>
<tr>
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<td>Continuous evaluation</td>
<td>100</td>
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</tbody>
</table>

Course contents:

It will consist of Assignments on Following Topics

PLM Software Data & Application Modeling (creating Items, Forms, LOVs, Options, Extensions, Different Rule like Naming, GRM, Deep Copy etc) Codeless and Codeful customization.

Server side Customization for creating Items, Objects, Custom Handlers, writing new APIs, Samples, Call server function from the Rich Client.

Client side Customization for creating User Interface, Adding Custom menu bar, custom menu items, using Eclipse Rich Client Plug –in.

Service Based Customization for Writing new Services API, Calling API through rich client and thin client.
Relevance of the course:
Seminar II gives opportunity to students to learn/study topics in the area of their interest, probably that will show them the way towards project work in second part.

Objectives of the course:
- To study and conduct mini projects/case studies.
- To study different types of recent technical research papers.
- To increase the presentation skills.

Evaluation scheme:

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
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<td>30</td>
</tr>
<tr>
<td>2</td>
<td>End Term Evaluation</td>
<td>70</td>
</tr>
</tbody>
</table>

Course contents:
The Seminar-II shall consist of few particulars amongst literature review based on a sizable number of publications. Design / Development / Synthesis related to a particular area. Implementation of existing theory for applications, pilot experiments etc. Each student is required to prepare a report and deliver a talk based on the work carried out as mini-project under the guidance of a faculty member(s). The work carried out should be preferable related to his/her dissertation topic.
MMP6011 DISSEMINATION PART I

Relevance of the course:
The dissertation of the M. Tech. project will enhance the research qualities of the students, This results in better projects and research. In this way they can contribute to industries and society.

Objectives of the course:
- To learn to do research.
- To invent / study newer technology.
- To find solutions to realistic industrial problems.

Evaluation scheme:

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Component</th>
<th>Weightage (%)</th>
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</thead>
<tbody>
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<td>Mid Term presentation</td>
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</tr>
<tr>
<td>2</td>
<td>End term dissertation I.</td>
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</tr>
</tbody>
</table>

Course contents:
Dissertation Part – I shall involve “Part Implementation” of the main project subjected to “Proficiency Development” on a setup, software or something relevant to the project topic which will have to be demonstrated during midterm presentation of the dissertation part-I. A report is required to be submitted on “Proficiency Development”.

MMP-6021  DISSEMINATION PART- II

Relevance of the course:
The dissertation of project will enhance the research qualities of the students, this results in better projects and research. In this way they can contribute to industries and society.

Objectives of the course:
- To find solutions to realistic industrial problems and optimize those.
- To learn to do research.
- To develop/ invent newer technology and software.

Evaluation scheme:

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<tr>
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<th>Component</th>
<th>Weightage (%)</th>
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</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>2</td>
<td>Dissertation II.</td>
<td>70</td>
</tr>
</tbody>
</table>

Contents:
The dissertation work shall consist of an extensive work, study or analysis of field / industrial problems with appropriate solutions or remedies. The bonafide work carried out for Dissertation Part – II should be potentially rich in terms of academics.

Dissertation Report
The project report shall be hard bound. It is a report on the work done by the student. It should have literature review, problem definition and formulation, adopted methodology, experimentation plan if any, results, conclusions, discussion and its relevance to the further work.

Examination
The viva-voce examination of the Dissertation Part – II shall consist of a presentation by the candidate and demonstration of the work carried out.