



JORDAN UNIVERSITY OF SCIENCE & TECHNOLOGY

DEGREE LEVEL

BACHELOR OF SCIENCE

NAME

PRODUCT DESIGN AND DEVELOPMENT ENGINEERING (PDDE)

MISSION

Prepare engineers who are proficient in converting ideas and needs into actual products.

PROGRAM EDUCATIONAL OBJECTIVES

1. Prepare graduates as skilled design thinkers who solve user-centered problems and innovate solutions throughout the entire product development process, from research to commercialization.
2. Prepare graduates who can best utilize CAD/CAM/CAE technologies.
3. Prepare graduates with strong project management, communication, and teamwork skills for cross-functional collaboration with stakeholders and non-technical audiences.
4. Prepare graduates with an entrepreneurial mindset, capable of identifying opportunities, developing plans, and understanding essential business aspects.

STUDENT LEARNING OUTCOMES

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. An ability to apply engineering design to produce user-centered solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. An ability to communicate effectively with a range of audiences.
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

CURRICULUM

1. Study Plan Contents

The **Product Design and Development Engineering (PDDE)** program takes an average of ten semesters to finish the required 160 credit hours. It is firmly believed that the **PDDE** curriculum is designed in such a way that its graduates are equipped with all the information (attributes, skills, and abilities) necessary for building the students' capacities in a comprehensive manner and preparing them for a successful career in the fields of product design and development. The curriculum is devised in a way that tackles all aspects of the workplace emphasizing, in addition to the technical components, the personal skills and competencies of the student.

Numbering and coding system of courses of the study plan.

Course Coding

The following codes are used to designate courses:

Department			Level/year	Course Topic	Academic Semester
A	B	C	x	Y	z

The Faculty of Engineering Departments codes (A, B, C) are as follows:

Code	Department	Code	Department
AE	Aeronautical Engineering	EE	Electrical Engineering
BME	Biomedical Engineering	IE	Industrial Engineering
CHE	Chemical Engineering	ME	Mechanical Engineering
CE	Civil Engineering	NE	Nuclear Engineering
PDDE	Product Design and Development Engineering		

Course Numbering

- The product design and development engineering courses are tabled and numbered in such a manner to recognize each course regarding its subject area, year or level, and semester offered.
- Ex. PDDE xyz: The **PDDE** symbol in the course number denotes product design and development Engineering and (xyz) is a 3-digits number:

A. The first digit (x) denotes the year level of the course according to student's study plan as follows:

Code	Level/year
1	First year
2	Second year
3	Third year
4	Fourth year
5	Fifth year

B. The second digit (y) denotes the course topic as follows:

Second number	Specialization
1	Engineering Fundamentals
2	Drawing and Design
3	Control and Automation
4	Mechanical Engineering
5	Manufacturing Engineering
6	Electrical Engineering
7	Management Engineering
8	Product Development Engineering
9	Practice and Graduation Project

C. The third digit (z) denotes the academic semester (odd=first semester, even=second semester) or the track number for fifth year standing elective courses offered according to the study plan.

Example: PDDE 386

PDDE	3	8	6
Product Design & Development Engineering	Level (Third year)	Field (Product Development Engineering)	Sequence (second semester)

Classification	Credit hours		
	Compulsory	Elective	Total
University Requirements	16	9	25
Faculty Requirements	32	-	32
Department Requirements	94	9	103
Total	142	18	160

1.1 University Requirements (25 Credit Hours)

1.1.1 Compulsory Courses: (16 Credit Hours): required by all students in the university.

1.1.2 Elective Courses: (9 Credit Hours):

Students must take three university elective courses from a list of university elective courses. Most of these courses are of humanities and social sciences nature.

1.2 Faculty Requirements: (32 Credit Hours): distributed as follows:

1.2.1 Courses from the Faculty of Engineering (6 C.H):

a. Courses from the Mechanical Engineering Department (2 C.H):

Course No.	Course title	Credit hours	Weekly Contact hours		Prerequisite
			Lecture	Lab	
ME 100	Engineering Workshops	1	0	3	---
ME 200	Engineering Drawing A	1	0	3	---
Total		2	0	6	

b. Courses from the Nuclear Engineering Department (4 C.H):

Course No.	Course title	Credit hours	Weekly Contact hours		Prerequisite/Co-request
			Lecture	Lab	
NE 114	Programming For Engineers	3	3	0	---
NE 100	Introduction to Engineering	1	1	0	---
Total		4	4	0	

1.2.2 Courses from the Faculty of Science and Arts (26 C.H)

a) Mathematics Courses (12 C.H):

Course No.	Course title	Credit hours	Weekly Contact hours		Prerequisite
			Lecture	Lab	
MATH 101	Calculus 1	3	3	0	---
MATH 102	Calculus 2	3	3	0	MATH 101
MATH 201	Intermediate Analysis	3	3	0	MATH 102
MATH 203	Ordinary Differential Equations	3	3	0	MATH 102
Total		12	12	0	

b) Physics Courses (7 C.H):

Course No.	Course title	Credit hours	Weekly Contact hours		Prerequisite
			Lecture	Lab	
PHYS 101	General Physics 1	3	3	0	---
PHYS 102	General Physics 2	3	3	0	PHYS 101
PHYS 107	General Physics Lab	1	0	3	PHYS 102 (or Co.)
Total		7	6	3	

c) Chemistry Courses (7 C.H):

Course No.	Course title	Credit hours	Weekly Contact hours		Prerequisite
			Lecture	Lab	
CHEM 101	General Chemistry 1	3	3	0	---
CHEM102	General Chemistry 2	3	3	0	CHEM 101
CHEM107	General Chemistry Lab	1	0	3	CHEM 102 (or Co.)
Total		7	6	3	

1.3 Department Requirements: (103 Credit Hours):

1.3.1 Department Compulsory Requirements: (94 Credit Hours):

Courses from faculty of Science and Arts (2 credit hours)

Course No.	Course title	Credit hours	Weekly Contact hours		Prerequisite
			Lecture	Lab	
Phys 211	Material and Temperature Properties	2	2	0	Phys 102
Total		2	2	0	

Courses from Department of Industrial Engineering (35 credit hours)

Course No.	Course title	Credit hours	Weekly Contact hours		Prerequisite
			Lecture	Lab	
IE 213	Mechanics of Materials 1	3	3	0	Phys 101
IE 214	Fluid and Thermal Science	3	3	0	CHEM 102
IE 216	Mechanics of Materials 2	3	3	0	IE 213
IE 218	Dynamics and Vibrations	3	3	0	Math 203, IE 213
IE 242	Probability and statistics	3	3	0	Math 102
IE 363	Engineering Materials	3	3	0	IE 216
IE 366	Manufacturing Processes I	3	3	0	IE 363
IE 367	Engineering Materials Lab	1	0	3	IE 363
IE 443	Quality Control	3	3	0	IE 242
IE 451	Human Factors Engineering	3	3	0	IE 242
IE 456	Production Planning and Inventory Control	3	3	0	IE 443
IE 468	Manufacturing Processes II	3	3	0	IE 366
IE 469	Manufacturing Processes Lab	1	0	3	Concurrent IE 468
Total		35	33	6	

Courses from Department of Electrical Engineering (3 credit hours)

Course No.	Course title	Credit hours	Weekly Contact hours		Prerequisite
			Lecture	Lab	
EE 303	Electrical Engineering Principles	3	3	0	Math 102, Phys 102
Total		3	3	0	

Program Compulsory Course Requirements: (54 Credit Hours)

Course No.	Course title	Credit hours	Weekly Contact hours		Prerequisite
			Lecture	Lab	
PDDE 281	Introduction to Product Development	2	2	0	NE 100
PDDE 321	Engineering Design Using Solid Modeling	1	0	3	ME 200
PDDE 322	Introduction to 3D interactive computer-aided platforms	1	0	3	PDDE 321
PDDE 323	Geometric Dimensioning and Tolerancing	1	0	1	PDDE 321
PDDE 340	Machine Element Design and Selection	3	3	0	IE 216
PDDE 342	Introduction to Hydraulic and Pneumatic Systems	3	3	0	IE 214
PDDE 360	Components Selection in Electric System Design	3	3	0	EE 303
PDDE 365	Economy and Engineering Management	2	2	0	IE 242
PDDE 370	Product Feasibility Study	3	3	0	PDDE 365
PDDE 423	Concurrent Engineering	3	3	0	PDDE 340, PDDE 342, PDDE 360, concurrent IE468
PDDE 426	Computer Aided Engineering Lab	1	0	3	PDDE 321
PDDE 428	Application of AI in Product Design	3	3	0	PDDE 370
PDDE 451	Tools Design	3	3	0	PDDE 323
PDDE 476	Product and Supply Chain Management	3	3	0	PDDE 370

Course No.	Course title	Credit hours	Weekly Contact hours		Prerequisite
			Lecture	Lab	
PDDE 481	Reverse Engineering	3	2	3	PDDE322, PDDE323, PDDE 340
PDDE 492	Engineering Training	3	3	0	Complete 117 CH
PDDE 521	Rendering and Animation Basics	2	0	6	PDDE 322
PDDE 571	Product Reliability, Testing and Evaluation	3	3	0	PDDE 482
PDDE 581	Rapid Prototyping	2	2	0	PDDE 481
PDDE 586	Rapid Prototyping Lab	1	0	3	PDDE 481, PDDE 581
PDDE 589	Product Casing and Packaging	3	3	0	PDDE 482, PDDE 423
PDDE 591	Graduation Project I	1	1	0	Complete 117 Credit Hours
PDDE 592	Graduation Project II	3	3	0	PDDE 492, PDDE 591
Total Credit Hours		54	47	21	

1.3.2 Department Elective Courses: (9 Credit Hours)

Students are required to choose (9 credit hours), among the followings:

Course No.	Course title	Credit hours	Weekly Contact hours		Prerequisite
			Lecture	Lab	
PDDE 531	Control Technology and Programmable Logic Controllers	3	3	0	PDDE 428
PDDE 553	Jigs and Fixtures Design	3	3	0	IE 468
PDDE 572	Manufacturing Supervision	3	3	0	Department Approval
PDDE 580	Sustainable Product Design	3	3	0	Completion of 100 C.H.
PDDE 582	Design of Contemporary Products	3	3	0	Completion of 100 C.H.
PDDE 583	System Integration	3	3	0	PDDE 423
PDDE 584	Cognitive Engineering	3	3	0	IE 451
PDDE 585	Micro-and Nanotechnologies Based Product Development	3	3	0	IE 468
PDDE 587	Engineering Entrepreneurship	3	3	0	Completion of 100 C.H.
PDDE 588	Special Topics in Product Design	3	3	0	Completion of 100 C.H.

1.4 Course Descriptions

ME 100: Engineering Workshops (1CH)

Development of basic skills in fields of hand filing, turning, welding, piping and plumbing, carpentry, sand casting, glass works, sheet metal fabrication, and household electric circuits. Theories related to metal machining, measurements, metal forming, sand casting, and welding.

ME 200: Engineering Drawing A (1 C.H) (Prerequisite: NE 100)

Drawing of engineering shapes, projections, deployments and intersections. Computer aided software.

IE 213: Mechanics of materials 1(3 C.H.) (Prerequisite: Phys 101)

Analysis of force systems, moments, equilibrium of rigid bodies, frames and machines, internal forces, stress and strain, mechanical properties of materials, axially loaded members, geometric properties of areas, bending loading and stresses and strains in beams, torsion loading and stresses in shafts.

IE 214: Fluids and Thermal Sciences (3 C.H.) (Prerequisite: Chem 102)

Laws of fluid statics, laws of mass and energy conservation, laws of thermodynamics, and conduction, convection and radiation heat transfer.

IE 216: Mechanics of Materials 2 (3 C.H.) (Prerequisite: Passing IE 213)

Concepts of transverse shear, combined loadings, stresses in pressure vessels, multi axial loading and stress transformations, failure theories, deflection of beams, buckling forces and stresses in columns, thermal loading and creep phenomena, dynamic loading and fatigue, and introduction to fracture mechanics.

IE 218: Dynamics and Vibrations (3 C.H.) (Prerequisite: Math 203, Passing IE 213)

Planar kinematics of rigid bodies, relative motion analysis for velocity and acceleration, planar kinetics of rigid bodies: force and acceleration, work-energy and impulse-momentum principles. The course also includes an introduction to free vibrations: harmonic motion, viscous damping, response to harmonic excitation of undamped and damped systems, and an introduction to forced vibrations.

IE 242: Probability and Statistics (3 Credit Hours)

Descriptive statistics, probability distributions of discrete and continuous random variables, simple design of engineering experiments and testing of hypotheses by analysis of variance using statistical analysis software

Pre-requisite: Math 102

IE 363: Engineering Materials (3 C.H.) (Prerequisite: Passing IE 216)

Atomic structure and bonding in metallic and nonmetallic materials, crystal structures and solid imperfections, elastic and plastic deformation, and metallic materials strengthening mechanisms including cold working, solution hardening, precipitation hardening, and dispersion hardening. Phase diagram, ferrous and nonferrous alloys formation. Other topics include: materials selection and heat treatments. The course focuses on understanding the relationship between materials structure, properties, processing, and performance in real life applications.

IE 366: Manufacturing Processes (1) (3 C.H.) (Prerequisite: IE 363+IE335)

Introduction to manufacturing processes with a focus on ferrous and non-ferrous metals, metal casting, rolling, forging, extrusion, drawing, machining.

IE 367: Engineering Materials Lab. (1 C.H.) (Prerequisite: IE 363)

Measuring the various properties of materials including tensile, hardness, fatigue, impact toughness, and creep. Metallographic and micro structural testing, corrosion testing, cold working, heat treatment; and nondestructive testing. Weekly experiments include data collection, data analysis, interpretation and presentation of results.

IE 443: Quality Control (3 C.H.) (Prerequisite: Passing IE 347)

Concepts and methods of quality, engineering specifications and tolerances, statistical process control (SPC) for variables and attribute data, acceptance sampling, process capability indices, and cost and management aspects of quality.

IE 451: Human Factors Engineering (3 C.H.) (Prerequisite: Passing IE 346)

Basics of ergonomics with a focus on anthropometric measurements, man-machine interaction, ergonomic design of workspace and hand tools, occupational hazards, and design of work environment.

IE 456: Production Planning and Inventory Control (3 C.H.) (Prerequisite: Passing IE 346)

Concept of value chain with a focus on supply chain analyses, capacity planning, inventory models, and demand forecasting. Additional topics include Material Requirement Planning (MRP) and job shop scheduling.

IE 468: Manufacturing Processes (2) (3 C.H.) (Prerequisite: IE 366)

Sheet-metal forming processes, forming and shaping of plastics and composite materials, forming and shaping of ceramics and glass, powder metallurgy, rapid prototyping technologies, and joining (welding, brazing, soldering, adhesive bonding, and mechanical fastening).

IE 469: Manufacturing Processes lab (1 C.H.) (Co-requisite: IE 468)

Sand casting, molding, thermoforming, welding, sheet metal forming, press working, machining, and forming using computer numerical control (CNC) machines.

EE 303 Electrical Engineering Principles (3 Credit Hours) (Pre-requisite: Phys 102, Math 102)

Electrical quantities. Circuit principles. Basics of DC and AC analysis. Polyphase circuits. Transformers. Semiconductor diodes. Bipolar transistors. Field effect transistors. Thyristors. Operational amplifiers.

PDDE 281 Introduction to Product Development (3 Credit Hours) (Pre-requisite: NE100)

This is a project-based course that covers modern tools and methods for product design and development. The course enables students to transition from ideas to prototyping and concept testing of their products and services. Students learn how best to identify need, collect customer requirements, formulate engineering specifications, generate concepts and then evaluate them effectively to translate ideas into marketable offerings so that the best product and service ideas are harnessed and create real value for customers and the organization. Class sessions are conducted in workshop mode and employ cases and hands-on exercises to reinforce the key ideas. Topics include identifying customer needs, concept generation, product architecture, industrial design, and design-for-manufacturing.

PDDE 321 Engineering Design Using Solid Modeling (1 Credit Hour) (Pre-requisite: ME 200)

A computer-aided design course using state-of-the-art solid modeling CAD/CAM software. Topics include 3D parametric solid modeling, applications associativity, design-by-feature, assembly modeling, injection mold design, flat pattern development, design analysis using FEA, realistic rendering, and detailing.

PDDE 322 Introduction to 3D interactive computer aided platforms (1 Credit Hour) Pre-requisite(s): PDDE 321

Use of parametric 3D modeling software, like CATIA, to prepare engineering documentation and model analysis for the automotive and aerospace manufacturing industries. Students will complete a series of laboratory assignments and term projects in an open lab environment.

PDDE 323 Geometric Dimensioning and Tolerancing (1 Credit Hour)(Pre-requisite: PDDE 321)

The use of CAD to create industrial level production working drawings. Includes the latest ASME Y14.5 standards for geometric dimensioning and tolerancing. Topics of discussion will include dimensions, fits, tolerances, surface finishes, symbols for welding, piping, machined elements/processes and sheet metal flat patterns.

PDDE 340 Machine Element Design and Selection (3 Credit Hours) (Pre-requisite: IE 216)

Design methodologies and failure theories for machine elements under static and dynamic loadings. Topics include design and selection of various machine elements, i.e. shafts, power screws, threaded fasteners, belt and chain drives, bearings, and gears.

PDDE 342 Introduction to Hydraulic and Pneumatics systems (3 Credit Hours) (Pre-requisite: IE 214)

This course is an introduction to the basic hydraulic and pneumatic systems and devices used in industrial products. Underlying scientific principles and their practical applications are covered. Students will learn about hydraulic pumps, fluid conductors, connectors, means of transmission system, control valves, reservoirs, seals, filters, accumulators, coolers and accessories, and control of fluid power.

PDDE 360 Components Selections in Electronic System Design (3 Credit Hours)(Pre-requisite: EE 303)

This course will provide the students with guide to select and use all types of electronic components, including: resistors, capacitors, chokes, inductors, transformers delay lines, interconnection devices, switches, relays, contactors, wire and cable discrete semiconductors, and integrated circuits.

PDDE 365 Engineering Economics and Management (2 Credit Hours) (Pre-requisite: MATH 201)

Cost concepts and classifications, breakeven analysis, time value of money, cash-flow diagrams and interest calculations, economic selection among investment alternatives, depreciation and income taxes.

PDDE 370 Product Feasibility Study (3 Credit Hours)(Pre-requisite: PDDE 365)

This course adopts a project-based learning method to provide the student the ability to do beneficial analysis along with qualitative and quantitative measures to ensure that a project can be completed to its design specifications. It also introduces the importance of local as well as International standards and regulations and conformity assessment in in the process of product launching into the local and international markets. Topics covered include: Risk reduction during product development, assess product viability, technology readiness levels (TRL), market share, technology and platform comparisons, and estimate of product development costs, economic feasibility analysis, green finance sand coordinate project timelines. Case studies.

PDDE 423 Concurrent Engineering (3 Credit Hours)(Pre-requisite: PDDE 340, PDDE 342, PDDE 360, concurrent IE468)

This course adopts a project-based learning method to teach design teams how to simplify product structure to reduce manufacturing and assembly costs, quantify improvements and how robustly design concepts for ensuring quality. Concepts such as modular design, design for manufacturing, assembly, reliability, and environment among others are covered. Axiomatic design and the theory of inventive problem-solving, also called TRIZ, to create creative ideas and solve design contradictions are also covered. Case studies are heavily discussed in this course.

PDDE 426 Computer Aided Engineering (1 Credit Hour) (Pre-requisite: PDDE 321)

The construction of accurate finite element analysis (FEA) models will be emphasized in this course. Using modern commercially available FEA software, computer aided engineering (CAE) skills will be developed through CAE analysis assignments and a course capstone design evaluation project. Topics include geometry preparation, meshing, material and geometric properties selection boundary conditions, and interpretation of results.

PDDE 428 Application of AI in Product Design (3 Credit Hours)(Pre-requisite: PDDE 370)

This course covers the fundamentals of AI applications in product design where students will be introduced to design ontology to formulate representations of design and apply practical aspects of data science through group projects. The course will teach students how to use AI tools such as machine learning and neural networks to collect data needed to develop and design a product as to understand factors that can crucially affect the acceptance and rejection of the product in the market.

PDDE 451 Tools Design (3 Credit Hours) (Pre-requisite: IE 468)

Tool design in manufacturing, design of cutting tools, design of dies for various manufacturing processes, clamping and work holding principles, and design of jigs and fixtures.

PDDE 476 Product and Supply Chain Management (3 Credit Hours) (Pre-requisite: PDDE 370)

This course covers the operations related to management of products through different manufacturing processes inside an organization as well as the warehouse management of raw material and finished goods to guarantee demand fulfillment.

PDDE 481 Reverse Engineering (3 Credit Hours)(Pre-requisite: PDDE322, PDDE323, PDDE 340)

This course adopts project-based learning to introduce the students to the concept, methodology and techniques in reverse engineering through practical case studies and class projects. Topics covered include Generating 3D CAD models from scanned data/CIMM and 3D scanners, Manipulate CAD data for CAM/NC or CNC machining processes or Rapid prototype, analyzing product functions and evaluate their performance. This course is hands-on in nature and will provide step-by-step instructions to guide the students through

two popular 3D modeling programs, Tinkercad and Fusion 360. Learners who complete this course will be able to use 3D software to design a wide variety of objects for both personal and professional use.

PDDE 492 Engineering Training (3 Credit Hours)

Students are required to spend eight weeks of practical training at a local or international firm. A student is obligated to submit a technical report expressing skills achieved through the activities performed during her/his training.

Pre-requisite: complete 117 Credit Hours

PDDE 521 - Rendering and Animation Basics (2 Credit Hours) (Pre-request: PDDE 322)

This course introduces students to the basic tools and concepts used in Adobe Photoshop and 3D animations tools (like 3ds Max). Photoshop instruction includes using layers, image editing using selection tools, filtering, and touching up a 3D render. Animation instruction (like in 3ds Max) includes importing models, adding materials, lighting a scene, creating a basic animation, photorealism and animation. Students will learn how to take models created in other programs learned throughout the DET program into 3ds Max and bring them to life. Video editing is covered to allow students to create professional animations and videos.

PDDE 531 Control Technology and Programmable Logic Controllers (3 Credit Hours) (Pre-request: EE 303)

Control theories and applications. Topics focus on mathematical modeling and analysis of transient and stable responses of physical systems. Additional topics include sensors (measurement of environmental conditions) and actuators (affecting the surrounding environment through a controlled response), Analog to digital (A/D and D/A) conversion, hydraulic and pneumatic systems, Programmable Logic Controllers (PLCs) and Computer Integrated Manufacturing (CIM).

PDDE 553 Jigs and Fixtures (3 Credit Hours)(Pre-requisite: IE 468)

This course will provide an introduction and explanation on the basic features uses, and applications of jigs and fixtures. Consideration is given to locating, clamping, work holding, workpiece analysis and part processing and tolerancing a jig and fixture, dimensioning assembly drawing and details for the manufacture of an industrial part. Radial and conical locators, templates, automated clamping and modular fixturing. The use of standard parts catalogs and library reference materials to solve design problems.

PDDE 571 Product Reliability, Testing and Evaluation (3 Credit Hours)(Pre-requisite: PDDE 482)

This course teaches students how to build and analyze reliability models, tools and techniques for fault identification and analysis. The student will learn how to select the appropriate test methodologies of the product to ensure the best performance as designed throughout the entirety of its intended life.

PDDE 572 Manufacturing Supervision (3 Credit Hours)(Pre-requisite: Department Approval)

The application of supervision skills. Students will gain an understanding of; motivation of subordinates, personal leadership theories, problem-solving and decision-making techniques, organizational communication, employee selection, evaluation and training process, and organizational structures. Topics will include; the American Disabilities Act, OSHA and environmental issues, Equal opportunity Employment, and Affirmative Action issues. Three lectures per week.

PDDE 573 Sustainability in Product Design and Development (3 Credit Hours) (Pre-requisite: PDDE 482, PDDE 423)

This course teaches students how to design a sustainable product considering social, economic and environmental aspects of sustainability. Topics cover theories of sustainability in product design such as design for longevity, designing products as part of a service, design for disassembly, Maintenance and fixing products. Other concepts that are essential in this course includes design to re-use, refurbish, recycle. The course will examine case studies showing these theories in practice.

PDDE 580 Sustainable Product Design Project (3 Credit Hours) (Pre-requisite: Completion of 100 C.H.)

This course is based on an industry project and aims to introduce the principles of sustainable design by developing an understanding of sustainable issues and an appreciation the impact of production and consumption patterns on the world's diminishing natural resources. Additionally, the unit introduces and applies eco-design strategies and technical skills to reduce the impact of materials and manufacturing processes on global ecosystems. The unit also aims to build product design and development skills through enhanced knowledge in materials and manufacturing systems.

PDDE 581 Rapid Prototyping (3 Credit Hours) (Pre-requisite: PDDE 481)

This course teaches the student how to takes the designs out of the computer and into the real world. This course includes first-hand looks at the machinery and techniques for rapid prototyping processes, besides other rapid technologies such as Subtractive based RPs, Hybrid Additive Manufacturing, and Rapid formative technologies are also covered. The students will also learn how the migration process of a product from the prototyping phase to mass product phase will affect the design. Processes Comparison, and details of process constituents. A class project is required to illustrate the effect of moving design form the conceptualization and prototyping phase to mass production phase.

PDDE 582 Design of Contemporary Products (3 Credit Hours) (Pre-requisite: Completion of 100 C.H.)

This course is designed to explore intersections of functionality and performance using an experimental platform to uncover opportunities within the built environment to create domestic products. Provides practical insights into the material manipulation and aesthetic experimentation that are essential for the design and fabrication of products. Lectures and case studies help students to learn

from examples and develop their own designs. Through a series of exercises, students design and fabricate a prototype using actual materials. The course addresses problems unique to product design, such as scale, weight, cost and production.

PDDE 583 System Integration (3 Credit Hours) (Pre-requisite: PDDE 423)

This course will introduce the student to the concept of system integration as a part of the development lifecycle and as a part of systems engineering in general, the students will learn how the different components of a system interrelate, and how each contributes product accomplishing its missions. Systems engineering terminology, which can so often confuse the newcomer, is presented in an easily digestible form. It also introduces the importance of local as well as international standards and regulations and conformity assessment in the process of product launching into the local and international markets. The course uses a system problem scenario extensively to illustrate systems engineering principles and specific product design issues.

PDDE 584 Cognitive Engineering (3 Credit Hours) (Pre-requisite: PDDE 474)

Provides an overview of human cognitive capabilities, limitations and techniques focusing what we know about cognition to guide the design of complex products, workplaces, and large systems. How do you best design a working environment for a stressed team to maximize their performance. Applications could range from simple use of mobile devices to an air-traffic control or nuclear plant command center. The end goal is to reduce mental effort, increase automaticity while improving performance

PDDE 585 Micro- and Nanotechnologies-Based Product Development (Pre-requisite: IE 468)

This course provides comprehensive information of the nanotechnology-based product development. It covers the micro- and nanotechnological aspects for product development with the product development point of view and also covers the industrial aspects, novel technologies, scale-up technologies and fundamental concept in the development of products. It focuses on the understanding and the design of micro-electromechanical devices (MEMS), on transducers (sensors, actuators) made using micro and nanofabrication technologies, to their co-integration with integrated circuits (IC), to their multiphysics simulation and characterization, to their reliability and their interconnect.

PDDE 586 Rapid Prototyping Lab (1 Credit Hour) (Pre-requisite: PDDE 481 and Concurrent with PDDE 581)

This laboratory provides the students with the skills necessary to use modern computer aided product development technologies and rapid prototyping techniques such as laser cutting, microcontroller programming (such as the Arduino system), and 3D printing techniques such as: fused deposition modeling, stereolithography, selective laser sintering, Laminated Object Manufacturing. The students will learn how to develop CAD models for 3D printing, import and export CAD data and generate .stl files, select a 3D printing process for an application, and produce product using 3D printing or additive manufacturing (AM).

PDDE 587 Engineering Entrepreneurship (3 Credit Hours) (Pre-requisite: Completion of 100 C.H.)

This course investigates the roles of inventors and founders in successful technology ventures. Through case studies and guest speakers, we introduce the knowledge and skills needed to recognize and seize a high-tech entrepreneurial opportunity – be it a product or service – and then successfully launch a startup or spin-off company. The course studies key areas of intellectual property, its protection and strategic value; opportunity analysis and concept testing; shaping technology driven inventions into customer-driven products; constructing defensible competitive strategies; acquiring resources in the form of capital, people and strategic partners; and the founder’s leadership role in an emerging high-tech company. Throughout the course emphasis is placed on decisions faced by founders, and on the sequential risks and determinants of success in the early growth phase of a technology venture.

PDDE 588 Special Topics in Product Design (3 Credit Hours) (Pre-requisite: Completion of 100 C.H)

Selected topics in product design and development.

PDDE 589 Product Casing and Packaging (3 Credit Hours) (Pre-requisite: PDDE 482, PDDE 423)

This course teaches students packaging design basics, packaging technologies, packaging functionality, labeling and positioning. Besides, it teaches students how to design esthetically appealing packages considering packaging materials, structure, imagery, package positioning and handling in addition to environmental ad sustainability aspects. The course covers the affordances principle in packages design and shipment requirements to minimize overall cost. Case studies are heavily discussed in this course.

PDDE 591 Graduation Project I (1 Credit Hour) (Pre-requisite: complete 117 Credit Hours)

The course prepares students to select a product based on a customer’s need, analyze and apply all product and developments principles. Projects are diverse in topics, have the potential to develop and apply in practice. Students are assigned to instructors for follow up, feedback and evaluation purposes.

PDDE 592 Graduation Project II (3 Credit Hours) (Pre-requisite: PDDE 492, PDDE 591)

During this course, students are expected to demonstrate their abilities to manage and execute a project and apply their attained course skills in developing a product. Each work team is obligated to submit a technical report and to present their work to a department committee.

First Year											
First Semester						Second Semester					
Course No.	Course Name	Total Credits	Lecture	Lab	Prerequisite	Course No.	Course Name	Total Credits	Lecture	Lab	Prerequisite
ME 100	Eng. Workshop	1	0	3	-	ME 200	Eng. Drawing A	1	0	3	-
HS 119	Entrepreneurship and Innovation	2	2	0	-	A 102	Arabic Communication skills	3	3	0	-
Math 101	Calculus 1	3	3	0	-	Math 102	Calculus 2	3	3	0	Math 101
Chem 101	General Chemistry 1	3	3	0	-	Chem 102	General Chemistry 2	3	3	0	Chem 101
Phys 101	General Physics 1	3	3	0	-	Chem 107	General Chemistry Lab	1	0	3	Chem 102 concurrent
NE 114	Programming for Engineers	3	3	0	-	Phys 102	General Physics 2	3	3	0	Phys 101
NE 114A	Programming for Engineers (practical)	0	0	3	-	Phys 107	General physics lab	1	0	3	Phys 102 concurrent
						NE 100	Introduction to Eng.	1	1	0	-
Total		15	14	6		Total		16	13	9	

Second Year											
First Semester						Second Semester					
Course No.	Course Name	Total Credits	Lecture	Lab	Prerequisite	Course No.	Course Name	Total Credits	Lecture	Lab	Prerequisite
Phys 211	Material and Temperature Properties	2	2	0	Phy 102	Math 203	Ordinary Differential Equations 1	3	3	0	Math 102
IE 242	Probability and Statistics	3	3	0	Math 102	IE 216	Mechanics of Materials 2	3	3	0	IE 213
Math 201	Intermediate Analysis	3	3	0	Math 102	IE 218	Dynamics and Vibrations	3	3	0	Math 203, IE 213
IE 213	Mechanics of Materials 1	3	3	0	Phys 101	IE 214	Fluid and Thermal Sciences	3	3	0	Chem 102
PDDE 281	Introduction to Product Development	2	2	0	NE 100	MS 100	Military Sciences	3	3	0	-
EL 101	English Language communication skills	3	3	0	Pass EL099, or 50% or more qualifying exam result	EL 103	Life Skills	2	2	0	-
Total		16	16	0		Total		17	17	0	

Third Year											
First Semester						Second Semester					
Course No.	Course Name	Total Credits	Lecture	Lab	Prerequisite	Course No.	Course Name	Total Credits	Lecture	Lab	Prerequisite
IE 363	Engineering Materials	3	3	0	IE 216	IE 366	Manufacturing Processes 1	3	3	0	IE 363
HS 110	Leadership and Social Responsibility	3	2	1	-	IE 367	Engineering Materials Lab	1	0	3	IE 363
EE 303	Electrical Engineering Principles	3	3	0	Phy 102, Math 102	PDDE 322	Introduction to 3D interactive computer-aided platforms	1	0	3	PDDE 321
PDDE 321	Engineering Design Using Solid Modeling	1	0	3	ME 200	PDDE 323	Geometric Dimensioning and Tolerancing	1	0	3	PDDE 321
PDDE 340	Machine Element Design and Selection	3	3	0	IE 216	PDDE 342	Introduction to Hydraulic and Pneumatic Systems	3	3	0	IE 214
PDDE 365	Economy and Engineering Management	2	2	0	IE 242	PDDE 360	Components Selection in Electric System Design	3	3	0	EE 303
	University Elective	3	3	0		PDDE 370	Product Feasibility Study	3	3	0	PDDE 365
Total		18	16	4		Total		15	12	9	

Fourth Year											
First Semester						Second Semester					
Course No.	Course Name	Total Credits	Lecture	Lab	Prerequisite	Course No.	Course Name	Total Credits	Lecture	Lab	Prerequisite
IE 443	Quality Control	3	3	0	IE 242	PDDE 423	Concurrent Engineering	3	3	0	PDDE 340, PDDE 342, PDDE 360, concurrent IE 468
IE 451	Human Factors Engineering	3	3	0	IE 242	PDDE 426	Computer Aided Engineering Lab	1	0	3	PDDE 321
PDDE 451	Tools Design	3	3	0	PDDE 323	PDDE 428	Application of AI in Product Design	3	3	0	PDDE 370
PDDE 476	Product and Supply Chain Management	3	3	0	PDDE 370	IE 456	Production Planning and Inventory Control	3	3	0	IE 443
PDDE 481	Reverse Engineering	3	3	0	PDDE 322, PDDE 323, PDDE 340	PDDE 342	Introduction to Hydraulic and Pneumatic Systems	3	3	0	IE 214
PDDE 365	Economy and Engineering Management	2	2	0	IE 242	IE 468	Manufacturing Processes II	3	3	0	IE 366
						IE 469	Manufacturing Processes Lab	1	0	3	IE 468 concurrent
							University Elective	3	3	0	
Total		15	15	0		Total		17	15	6	

Fourth Year / Summer Semester			
Course No.	Course Name	Total Credits	Prerequisite
PDDE 492	Engineering Training	3	Complete 117 Credit Hours Successfully
Total		3	

Fifth Year											
First Semester						Second Semester					
Course No.	Course Name	Total Credits	Lecture	Lab	Prerequisite	Course No.	Course Name	Total Credits	Lecture	Lab	Prerequisite
PDDE 521	Rendering and Animation Basics	2	0	6	PDDE 322	PDDE 586	Rapid Prototyping Lab	1	0	1	PDDE 481, PDDE 581
PDDE 571	Product Reliability, Testing and Evaluation	3	3	0	PDDE 482	PDDE 592	Graduation Project 2	3	3	0	PDDE 492, PDDE 591
PDDE 581	Rapid Prototyping	3	3	0	PDDE 481		Program Elective	3	3	0	
PDDE 589	Product Casing and Packaging	3	3	0	PDDE 482, PDDE 423		Program Elective	3	3	0	
PDDE 591	Graduation Project 1	1	1	0	Complete 117 credit hours		University Elective	3	3	0	
	Program Elective	3	3	0							
Total		15	13	6		Total		13	12	3	