NEW PRODUCT DEVELOPMENT

ENIE 385

Lecture	**: 3**	**Year : III**
Tutorial	**: 2**	**Part : II**
Practical	**: 1**	

Course Objectives:

The objective of this course is to develop fundamental understanding of the principles, processes, and strategies of New Product Development, including product life cycle stages and development methodologies. The course aims to build competency in applying modern tools and systematic approaches to design, evaluate, and communicate effective product concepts suitable for real-world applications.

1 Introduction (6 hours)

1.1 Definition and classification of new products
1.2 New product versus product improvement versus innovation
1.3 New product development (NPD): Concepts and scope
1.4 Customer-centric product design and value creation
1.5 Value Proposition Canvas and design thinking basics

2 Innovation and Strategic Importance of NPD (10 hours)

2.1 Drivers of new product development: Technology, competition, globalization
2.2 Types of innovation: Incremental, radical, disruptive
2.3 Open innovation and collaborative development
2.4 Role of sustainability and environmental, social and governance (ESG) in product development
2.5 Importance of NPD for firm competitiveness and growth

3 New Product Development in Goods and Service Industries (5 hours)

3.1 Differences between goods and service product development
3.2 Product-service systems (PSS)
3.3 Servitization in manufacturing industries
3.4 Case examples from industrial and service sectors

4 NPD and Growth Strategies (5 hours)

4.1 Product-market growth strategies (Ansoff matrix)
4.2 Diversification and expansion strategies
4.3 Blue ocean strategy concept
4.4 Platform-based and ecosystem products
4.5 Strategic alignment of NPD with business goals

5 New Product Development Process (14 hours)

5.1 Idea generation techniques
5.2 Concept generation and selection
5.3 Product architecture and industrial design
5.4 Product design and development (CAD, prototyping, 3D printing)
5.5 Agile and lean product development approaches
5.6 Minimum viable product (MVP) concept
5.7 Market testing (pilot testing, A/B testing)
5.8 Stage-Gate process: Governance and decision points
5.9 Product launch, commercialization and post launch review

6 Digital and Data-Driven Product Development (5 hours)

6.1 Role of data analytics in product development
6.2 Internet of Things (IoT) integration in industrial products
6.3 Artificial Intelligence in product design and forecasting
6.4 Product lifecycle management (PLM) systems
6.5 Digital transformation in NPD

Tutorial (30 hours)

1. Document preparation for a specific real-world challenge or unmet need within a local or industrial context
2. Applying creative techniques to develop an original product or service idea that addresses the identified problem
3. Generate and develop a new product idea or service idea that addresses the identified problem
4. Prepare a basic prototype or conceptual model to demonstrate the product's core features
5. Conduct a baseline analysis of the technical requirements, market demand and economic viability of the proposed solution
6. Deliver a professional presentation and project report, simulating a business pitch to potential stakeholders or investors

Practical (15 hours)

1. Case study discussions on successful and failed products
2. Group exercises on idea generation and screening
3. Preparation of value proposition canvas
4. Business model development using real-world examples
5. Developing MVP design and testing strategies
6. Presentation and peer review of product ideas

Final Exam

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

Chapter	Hours	Mark distribution*
1	6	8
2	10	8
3	5	6
4	5	6
5	14	20
6	5	10
Total	**45**	**60**

* There may be minor deviation in marks distribution.

References

1. Kahn, K. B. (Ed.). (2013). The PDMA handbook of new product development. John Wiley & Sons.
2. Kim, W. C., Mauborgne, R. (2015). Blue ocean strategy: How to create uncontested market space and make the competition irrelevant. Harvard Business Review Press.
3. Kotler, P., Keller, K. L. (2016). Marketing management. Pearson.
4. Ries, E. (2011). The lean startup: How today's entrepreneurs use continuous innovation to create radically successful businesses. Crown Business.
5. Ulrich, K. T., Eppinger, S. D. (2015). Product design and development. McGraw-Hill Education.

INDUSTRIAL HEALTH, SAFETY AND ENVIRONMENTAL MANAGEMENT

ENIE 386

Lecture	**: 3**	**Year : III**
Tutorial	**: 2**	**Part : II**
Practical	**: 1**	

Course Objectives:

The objective of this course is to develop knowledge and competency in the principles and practices of environmental management and integrated management systems based on ISO 14001 standards within the context of Nepal's industrial sector. The course emphasizes the application of environmental impact assessment processes (IEE/EIA) and the integration of national labor laws to promote worker well-being, regulatory compliance, and sustainable industrial productivity.

1 Introduction to Industrial Health and Safety (4 hours)

1.1 Introduction, scopes of industrial health and safety
1.2 Evolution of safety practices
1.3 Role of industrial engineers in safety
1.4 Importance in Nepali industries (Manufacturing, hydropower, construction)
1.5 Basic terminology (Hazard, risk, accident, incident)
1.6 Role of safety in productivity and quality

2 Workplace Hazard and Risk Assessment (5 hours)

2.1 Types of hazards (Physical, mechanical, chemical, biological, ergonomic, psychological)
2.2 Working at height hazards and fall protection strategies
2.3 Hazard identification techniques (HAZID, HAZOP, checklists, job safety analysis, human error analysis (HEA))
2.4 Risk assessment techniques (Fault tree analysis, failure mode and effect analysis) and risk rating method
2.5 Exposure limits (TLV, PEL)
2.6 Reliability in safety
2.7 Risk control hierarchy

3 Industrial Hygiene (6 hours)

3.1 Principles of Industrial hygiene
3.2 Air contaminants: Dust, fumes, gases
3.3 Workplace housekeeping
3.4 Ventilation systems

3.5 Occupational diseases and musculoskeletal disorder (Silicosis, asbestosis, hearing loss), fatigue, stress
3.6 Prevention of occupational disease and musculoskeletal disorder
3.7 Monitoring and control techniques
3.8 Personal protective equipment (PPE) and their application
3.9 Monitoring and control techniques

4 Safety Engineering and Accident Prevention (6 hours)

4.1 System safety concept, accident causation theories (Domino theory, human factors)
4.2 Safety in product/process design
4.3 Safety committee at workplace
4.4 Accident investigation and reporting
4.5 Machine guarding and safety devices
4.6 Lockout-Tagout (LOTO) for maintenance and repair
4.7 Material handling at workplace
4.8 Electrical safety
4.9 Fire hazards and fire prevention

5 Emergency Preparedness and Disaster Management (6 hours)

5.1 Emergency preparedness and response
  5.1.1 Fire alarm
  5.1.2 Emergency exit
  5.1.3 Evacuation plan
  5.1.4 Assembly point
5.2 Types of fire, fire extinguisher and their use
5.3 Fire safety and evacuation
5.4 First aid basics
5.5 Industrial disaster management
5.6 Safety performance measurement (Accident frequency rate and severity rate, Safety data analysis, cost of accidents)

6 Safety Management Systems, Laws and Regulations (6 hours)

6.1 Safety organization and responsibilities
6.2 Code and regulations for worker safety and health
6.3 Safety policies and procedures
6.4 Safety audits and inspection
6.5 Safety training and awareness
6.6 Rules and regulations of national and international organizations regarding hygiene and safety, ISO 45001
6.7 Role of department of labor and occupational safety and health in Nepal

7 Environmental Management (2 hours)

7.1 Environmental management tools
7.2 Green and brown sector
7.3 Environmental management efforts in Nepal
7.4 Environmental emission standard

8 Environmental Pollution, Impacts and Management Approaches (4 hours)

8.1 Anthropogenic and natural impacts
8.2 Sources of pollutants
8.3 Pollution control and prevention
8.4 Waste management system
8.5 Impacts on human health and environment

9 Environmental Assessment System and Management (6 hours)

9.1 Environmental impact assessment (EIA)
9.2 Initial environment examination (IEE)
9.3 Scopes in Nepalese Industries
9.4 Evolution of EMS
9.5 Introduction to ISO 14001 clauses
9.6 Scope, benefits and success factors
9.7 Certification processes and types

Tutorial (30 hours)

1. Safety concepts, hazard, risk, incident, near miss, hazard identification
2. Preparation of sample hazard checklist for a workshop
3. Analysis of a given accident case and identify root causes and preventive measures
4. Preparation of basic risk assessment table and risk assessment report preparation
5. Identification of ergonomic problems in workplace and suggestion of improvements in workstation design
6. Documentation of machine hazards, safety measures and electrical safety precautions
7. Development of safety audit of a small facility
8. Identification of unsafe conditions for case examples
9. Drawing of PDCA(Plan-Do-Check-Act) cycle and apply it to a simple industry
10. Criteria formulation for evaluating significant environmental aspects and selecting aspects for control
11. Developing objective for given environmental issue and link objectives with improvement plans
12. Legal and regulatory requirements of environmental laws applicable in Nepal

Practical **(15 hours)**

1. Hazard Identification in workshop/lab
2. Noise level measurement
3. Illumination measurement
4. PPE demonstration and usage
5. Fire extinguisher handling
6. Industrial visit and safety report
7. Environmental aspect and impact identification using case study of a local industry

Final Exam

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

Chapters	Hours	Marks distribution*
1	4	6
2 and 3	11	14
4	6	8
5 and 6	12	16
7 and 8	6	8
9	6	8
Total	**45**	**60**

* There may be minor deviation in marks distribution.

References

1. Asfahl, C. R., Rieske, D. W. (2019). Industrial safety and health management. Pearson.
2. Davis, M. L., Masten, S. J. (2013). Principles of environmental engineering and science. McGraw-Hill Education.
3. International Organization for Standardization. (2004). Environmental management systems: Requirements with guidance for use (ISO 14001:2004). ISO.
4. Krishna, I. V. M., Manickam, V. (2017). Environmental management: Science and engineering for industry. Butterworth-Heinemann.
5. Mistry, K. U. (2008). Fundamentals of industrial safety and health. Siddhartha Prakashan.
6. Reese, C. D. (2018). Occupational health and safety management: A practical approach. CRC Press.