Course Title:	**Model Driven Engineering**
Course Code:	CSE562/1
Program:	Master Degree In Computer Engineering
Department:	Computer Engineering
Course coordinator:	Mr. AHMED KHLIFI
Institution:	Private Higher School of Engineers of Gafsa (ESIP)

A. Course Identification

1. Credit hours: **3 (1.5-0-1.5)**

2. Course type

a. College ☐ Department ■ Others ☐

b. Fundamental ■ Transversal ☐ Optional ☐

3. Level/year at which this course is offered: 3.1/3

4. Pre-requisites for this course (if any): UML modeling, Software Engineering Fundamentals

1. Mode of Instruction (mark all that apply

No	Mode of Instruction	Contact Hours	Self-study	Total workload
1	**Traditional classroom**	…..	22	52
2	**Blended**	30		
3	**E-learning**	.....		
4	**Distance learning**	.....		
5	**Other ()**	.....		

2. Contact Hours

No	Activity	Contact Hours
1	**Lecture**	15
2	**Laboratory/Studio**	15
3	**Tutorial**	-
4	**Others** (specify)	-
	Total	30

B. Course Objectives and Learning Outcomes

Course Description

This course provides a comprehensive introduction to Model-Driven Engineering (MDE), covering its concepts, principles, and practical applications. It explores the use of models as central artifacts in software development, focusing on topics such as metamodelling, model transformations, and the Model-Driven Architecture (MDA) approach. The course includes hands-on activities to design and manipulate models using state-of-the-art tools like Eclipse and Kermeta.

Course Main Objective

- To provide an advanced understanding of the principles, theories, and practices of Model-Driven Engineering (MDE) and its applications in solving complex software development challenges.
- To enable students to design and implement metamodels and transformations using standardized tools like MOF, UML, OCL, and Eclipse Modeling Framework.
- To equip students with skills to evaluate and optimize MDE-based solutions for real-world applications, including IoT, embedded systems, and software architecture.
- To develop project management, teamwork, and communication skills by working on collaborative projects related to MDE practices.
- To prepare students to integrate MDE approaches into specialized fields such as software engineering, IT security, or artificial intelligence, addressing industry-specific challenges.
- To foster critical thinking and research capabilities for analyzing emerging trends in MDE and contributing to scholarly publications or innovative projects.

1. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	✓ Understand core principles, theories, and practices of MDE.	PLO.K.1
1.1	✓ Apply advanced knowledge of MDE in specialized areas of software engineering.	PLO.K3
2	**Skills**	
2.1	✓ Effectively communicate complex technical concepts in MDE through presentations and reports.	PLO.S2
3.1	✓ Demonstrate project management and teamwork in MDE-focused development tasks.	PLO.S3
6.1	✓ Analyze and evaluate MDE solutions for their integration into Internet of Things (IoT) infrastructures.	PLO.S6
7.1	✓ Design, analyze, and implement MDE solutions that address real-world challenges and respect ergonomic, dynamic, and static constraints.	PLO.S7

C. Course Content

No	List of Topics	Contact Hours
1	☐ **Chapter 1: Introduction to Model-Driven Engineering (MDE)** 1. Motivations and Challenges of MDE 2. Evolution of Software Engineering and MDE 3. Role of Models in Software Development 4. Key Concepts: Abstraction and Automation 5. Benefits of MDE in Complex Systems	4
2	☐ **Chapter 2: Models, Metamodels, and Transformations** 1. Defining Models and Metamodels 2. Conformance Relationships 3. 4-Level Hierarchy: MOF, UML, and Application Models 4. Model Transformations: Types and Use Cases 5. Practical: Model Creation and Transformation	6
3	☐ **Chapter 3: Model-Driven Architecture (MDA)** 1. Principles of MDA: CIM, PIM, PSM 2. MDA in Software Development 3. Supporting Standards: MOF, XMI, UML 4. MDA Process: Business and Platform Models 5. Case Studies in Software Development	7
4	☐ Chapter 4: **MDE Tools and Technologies** 1. Overview of Modeling Tools 2. Practical: Model Design with Eclipse 3. Introduction to MOF and OCL 4. Other Key MDE Tools	6
5	☐ Chapter 5: **Verification, Simulation, and Industry Applications** 5. Verifying Model Consistency 6. Model Simulation and Execution 7. Case Studies: Domain-Specific Models 8. MDE in Industry: IoT, Embedded Systems 9. Challenges and MDE Standard	7
Total		30

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
PLO.K1	✓ Understand core principles, theories, and practices of MDE.	Lecturing Course project Assignment work	Assignments, Quizzes, homework
PLO.K2	✓ Apply advanced knowledge of MDE in specialized areas of software engineering.		
2.0	**Skills**		
PLO.S2	✓ Effectively communicate complex technical concepts in MDE through presentations and reports.	- Lectures - Class discussions - Course project Assignment work - projects	Assignments, Report, Quizzes, Exams
PLO.S3	✓ Demonstrate project management and teamwork in MDE-focused development tasks.		
PLO.S6	✓ Analyze and evaluate MDE solutions for their integration into Internet of Things (IoT) infrastructures.		
PLO.S7	✓ Design, analyze, and implement MDE solutions that address real-world challenges and respect ergonomic, dynamic, and static constraints		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quizzes, Homework assignments	Random	00%
2	Final Exam	11	100%

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:
- Office hours - Blackboard interface

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	1. Brambilla, M., Cabot, J., & Wimmer, M. (2017). *Model-Driven Software Engineering in Practice: Second Edition*. Springer. 2. García DíazVicente, et al. *Advances and Applications in Model-Driven Engineering*. Hershey, PA, Information Science Reference, 2014. 3. Scott Tilley and Brianna (2014). *Hard Problems in Software Testing: Solutions Using Testing as a Service (TaaS)* 4. Jean-Marc Jézéquel, Benoit Combemale, Didier Vojtisek. Ingénierie Dirigée par les Modèles : des concepts à la pratique.... Ellipses. Ellipses, pp.144, 2012
Essential References Materials	▪ NA
Electronic Materials	▪ Online Courses on MDE & UML – Coursera, Udacity, Pluralsight ▪ YouTube Channels: Modeling Languages, Eclipse Foundation, Software Engineering Daily
Other Learning Materials	NA

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	**classroom board software …**
Technology Resources (AV, data show, Smart Board, software, etc.)	**data show;**

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment.	Students, course coordinator, Alumni, Employers	Direct/Indirect
Extent of achievement of course learning outcomes.	Faculty, Program Leaders, quality department	Direct
Quality of Learning resources	Faculty, Program Leaders,	Direct, Indirect
Teaching and learning quality and effectiveness.	Students, Faculty Program Leaders,	Direct, Indirect

H. Specification Approval Data

Council / Committee	Computer Engineering Council
Date	05/10/2022