SCHEDA DELL'INSEGNAMENTO (SI)

"SMART MODELING OF INDUSTRIAL PRODUCTION SYSTEMS

SSD ING-IND/17

DENOMINAZIONE DEL CORSO DI STUDI: INGEGNERIA MECCANICA PER LA PROGETTAZIONE E LA PRODUZIONE

ANNO ACCADEMICO 2022 - 2023

INFORMAZIONI GENERALI - DOCENTE

DOCENTE: GUIDO GUIZZI
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INFORMAZIONI GENERALI - ATTIVITÀ

ANNO DI CORSO: I o II
PERIODO DI SVOLGIMENTO, SEMESTRE: I
CFU: 9

INSEGNAMENTI PROPEDEUTICI (se previsti dal Regolamento del CdS)

"None"

EVENTUALI PREREQUISITI

"None"

OBIETTIVI FORMATIVI

The course will provide the student with fundamental knowledge for the development of agent-based, discrete-event and multi-method simulation models for industrial production systems in deterministic and stochastic domains. The main architectures of the smart factory and smart logistics models for material handling will be presented, with particular emphasis on Reference Models and Reference Architecture. By means of application examples, the student will acquire knowledge on the use of software tools for the integration of information coming from IoT sensors and PLC systems.

RISULTATI DI APPRENDIMENTO ATTESI (DESCRITTORI DI DUBLINO)

Conoscenza e capacità di comprensione

The student must demonstrate knowledge and understanding of issues related to the management of an intelligent factory in which market needs are taken into account-in terms of mix and production volumes-he shall demonstrate the ability to evaluate the impact of different decisions on plant performance from the notions learned during the training course. The training course aims to provide students with the basic knowledge and methodological tools for managing operations, costs, and quality while also considering aspects of sustainability

Capacità di applicare conoscenza e comprensione

Through the implementation of project work, the student has to show that he/she is able to apply the learned techniques and methodological tools to proposed case studies. The training is focused on teaching the skills and methodological tools necessary for the industrial world to deal in a highly competitive environment and to manage complex projects/programs by having a holistic view of the problem.

PROGRAMMA-SYLLABUS

- *Basic simulation concepts: deterministic and stochastic.*
- *Agent-based, discrete-event and multi-method modelling for production plant and logistics*
- *systems: functional logic, performance evaluation, Key Performance Indicators (KPIs).*
- *Architecture of an industrial digital twin: Reference Model, Reference Architecture and*
- *archetypes of plant parts, communication architecture and interaction logics.*
- *Communication protocols towards the PLC: OPC/UA, MTConnect and MQTT.*
- *Development of models of complex systems integrating operators, automatic machines and*
- *material handling systems.*
- *Smart logistics: Intelligent internal transport systems - AGVs. Fleet management policies of*
- *transport systems for plant logistics. KPIs for logistics.*
- *Development of dashboards for KPI analysis.*
- *What if analysis. Simulation-based optimization.*
- *Numerical and software tool exercises.*

MATERIALE DIDATTICO

Averill Law, W. David Kelton, (2000), Simulation Modeling and Analysis, Third Edition, McGraw-Hill Education

Teaching materials provided by the lecturer
White Papers of the communication protocols

MODALITÀ DI SVOLGIMENTO DELL'INSEGNAMENTO-MODULO

The lecturer will use:
(a) Lectures for 50% of the total hours,
b) Exercises to practically show theoretical aspects for 20% of the total hours
c) Laboratory to deepen applied knowledge (in order to carry out project work) 25%.
d) In-depth seminars 5%.

VERIFICA DI APPRENDIMENTO E CRITERI DI VALUTAZIONE

a) **Modalità di esame:**
Nel caso di ***insegnamenti integrati*** *l'esame deve essere unico****.***

L'esame si articola in prova	
scritta e orale	
solo scritta	
solo orale	X
discussione di elaborato progettuale	X
altro	

b) Modalità di valutazione:
N.A.