UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2021/2022
MASTER'S DEGREE (MSC)	MANAGEMENT ENGINEERING
SUBJECT	CIM & DIGITAL MANUFACTURING
TYPE OF EDUCATIONAL ACTIVITY	B
AMBIT	50368-Ingegneria gestionale
CODE	21719
SCIENTIFIC SECTOR(S)	ING-IND/16
HEAD PROFESSOR(S)	RANA HARIKRISHNASINH — Ricercatore a tempo determinato — Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	98
COURSE ACTIVITY (Hrs)	52
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	2
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**RANA HARIKRISHNASINH** Tuesday 10:00 11:00 stanza docente

DOCENTE: Prof. HARIKRISHNASINH RANA

PREREQUISITES	Fundamentals of machining processes. Fundamentals of CAD techniques. General concepts of mathematical analysis and geometry.
LEARNING OUTCOMES	Knowledge and understanding The student at the end of the course will have acquired knowledge and methods to address and solve in an original way some aspects of the integration of highly automated production systems (CIM). In particular, reference will be made to the integration of systems operating in the field of the production of mechanical parts through Numerical Controlled machines tools Applying knowledge and understanding The student will have acquired the knowledge and methodologies for automated writing of the part program for some milling and 3D printing operations on Numerical Controlled machines tool, through the use of CAD / CAM systems. Making judgments The student will have acquired an integrated view of the problems related to manufacturing production, with a focus on manufacturing automation. The student will be able to identify the correct functioning mode of the operating machines chosen for individual applications. Communication skills The student will be able to communicate competently and with appropriated terminology on techniques of part programming and topics related to integrated production systems . The student will also be able to analyse and propose solutions on issues related to the course. Learning ability The student will be able to develop of practical examples of modeling of parts and production of programs for numerical control machine tools with the use of a software (Fusion 360) for the part-program generation for simple operations of milling and 3D printing. The student will be able to propose the more suitable part program for the production of a complex mechanical component
ASSESSMENT METHODS	A Practice Test and an Oral Exam. 1. Assessment procedure for the Practice Test The Practice Test, during about 2 hours, consists of the development of a process plan for a milling manufacturing process with the CAD/CAM software utilized during the classroom training The practice test aims to determine the required skills, experties and capabilities. The assessment is expressed out of 30 and admission to oral test is determined by a minimum score (18/30). 2. Evaluation criteria for the oral examination The oral test consists of an interview, in order to check the student's acquisition of skills and disciplinary knowledge provided by the course; the evaluation is expressed out of 30. The questions (generally not less than 3), both open and semi-structured, are specifically designed to test the outcomes. The oral examination aims at ascertaining not only the acquired knowledge but also the adequacy of presentation skills with respect to the course contents concerning the modern digital manufacturing processes and their integration within production systems. Given that between sessions of examination is not possible to maintain the same level of difficulty between the pratice and oral tests, the final rating is a weighted average, depending on the difficulty of the single trial (assessed by the teacher on a case by case basis), of the score of the Practice Test and that of the Oral Exam. Excellent (30-30 and praise): very good knowledge of the topics, excellent language skills, good analytical ability, the student is able to apply knowledge to solve problems proposed. Very Good (27-29): Good command of the topics, full language skills, the student is able to apply knowledge to solve the proposed problems. Good (24-26): basic understanding of the main topics, good language skills, with limited ability to independently apply the knowledge to the solution of the proposed problems. Satisfactory (21-23): has not full command of the main teaching subjects but it has the knowledge, satisfactory property language, poor ability to independently apply the acquired knowledge. Sufficient (18-20): Minimum basic understanding of the major teaching and technical language issues, very little ability to independently apply the acquired knowledge. Insufficient: the student does not have a minimum acceptable knowledge of the contents of the topics covered during the course.
EDUCATIONAL OBJECTIVES	The student, at the end of the course, will have acquired the knowledge and practical methodologies for the development and simulation of machining on

	CNC machines. He/she be able to analyze the results of the simulations and to optimize the operating parameters in order to obtain higher performance results . The student will be able to perform the function of analysis of production systems, in order to develop procedures for the optimization of integration of the same.
TEACHING METHODS	Frontal lessons. Classroom exercises. Laboratory work experience. Learning resources on: http://elearning.unipa.it/
SUGGESTED BIBLIOGRAPHY	Appunti a cura del docente disponibili su http://elearning.unipa.it Testi di riferimento (disponibili presso la biblioteca del Dipartimento di Ingegneria): Chang - Wysk – Wang,“Computer-Aided Manufacturing”, Prentice-Hall - ISBN 978-0131429192 Mikell P. Groover, “Automation, Production Systems and Computer-Integrated-Manufacturing”, Prentice-Hall - ISBN 0132393212

SYLLABUS

Hrs	Frontal teaching
4	Introduction and objectives of the course. CIM: Definitions and description of main modules.
4	CAD and CAD/CAM systems in CIM environment. IoT and IIOT devices
6	Overview on Process Planning. Group Technology (GT) and clustering techniques for part family formation
5	The Computer Aided Process Planning (CAPP). Variant CAPP systems. Generative CAPP systems. Expert CAPP systems
10	A CAD/CAM system - Part modeling, development of plan process for milling operations and 3D printing.

Hrs	Practice
8	Use of CAD/CAM system and 3D Solid Modeling with Fusion 360
12	Milling operations: facing, contouring, drilling and pocket machining
5	3D Print: CAD file development, STL file production and Building Up.