

## FRANCESCO VEGLIO'

| PROGRAMME OF "TEORIA DELLO SVILUPPO DEI PROCESSI CHIMICI"<br>"THE DESIGN OF INDUSTRIAL EXPERIMENTS IN R&D ACTIVITIES IN PROCESS ENGINEERING APPLICATIONS"   |  |  |
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| <ul style="list-style-type: none"> <li>• CODE: I0630</li> <li>• TYPE OF COURSE UNIT: COMPULSORY FOR THE CHEMICAL ENGINEERING SPECIALIZATION</li> <li>• LEVEL OF COURSE UNIT (E.G. FIRST, SECOND OR THIRD CYCLE; SUB-LEVEL IF APPLICABLE): FIRST CYCLE</li> <li>• YEAR OF STUDY (IF APPLICABLE); SEMESTER: SECOND YEAR, SECOND SEMESTER</li> </ul> |  |  |
| NUMBER OF ECTS CREDITS: 9 (WORKLOAD OF 90 HOURS OF TEACHING + WORK AT HOME; 1 CREDIT = 25 HOURS OF TOTAL ACTIVITIES)  |  |  |
| <b>Teacher: Prof. Francesco Veglio'</b>   |  |  |
| 1   | <b>Course objectives</b>   | THE MAIN OBJECTIVE OF THE COURSE IS TO GIVE TO THE STUDENT THE MAIN INFORMATION AND TOOLS ON BASIC AND APPLIED STATISTIC, DESIGN OF INDUSTRIAL EXPERIMENTS AND MULTIVARIATE ANALYSIS IN THE AMBIT OF ENGINEERING APPLICATIONS. IN THIS MANNER THE STUDENTS SHOULD BE ABLE TO ORGANIZE EXPERIMENTAL TESTS IN LAB, PILOT AND INDUSTRIAL SCALE AND TO BE SKILLED IN THE DATA ANALYSIS IN THE FIELD OF INDUSTRIAL ENGINEERING AREA WITH PARTICULAR ATTENTION TO CHEMICAL ENGINEERING APPLICATIONS. THIS MODULE IS LINKED TO THE OTHER TEACHING MODULES OF THE THIRD YEAR BECAUSE IT GIVES THE IDEA THAT THE "WORLD" IS NOT DETERMINISTIC AND AT THE SAME TIME IT GIVES SOME USEFUL AND PRACTICAL SKILLS OFTEN REQUIRED IN THE INDUSTRIES FOR THEIR STATISTICAL PROCESS CONTROL TOOLS (SPC).  |
| 2   | <b>Course content and Learning outcomes (Dublin descriptors)</b> | <p>TOPICS OF THE MODULE INCLUDE:<br/>INTRODUCTION TO PROBABILITY CONCEPTS. BASIC STATISTICAL CONCEPTS AND THEOREMS. HISTOGRAM CONSTRUCTION AND PROBABILITY DISTRIBUTIONS. STATISTICAL INFERENCE: PRECISION AND ACCURACY OF EXPERIMENTAL MEASURES. STATISTICAL TESTS AND CONTROL CHART, PROCESS CAPABILITY. LINEAR AND NOT LINEAR REGRESSION ANALYSIS. ANOVA. FULL FACTORIAL EXPERIMENTS. FACTORIAL EXPERIMENTS WITH CONFUSION. FRACTIONAL FACTORIAL EXPERIMENTS. SURFACE RESPONSE METHODOLOGY. MULTIVARIATE ANALYSIS (PCA). INDUSTRIAL PRACTICAL EXAMPLES.</p> <p>ON SUCCESSFUL COMPLETION OF THIS MODULE, THE STUDENT SHOULD</p> <ul style="list-style-type: none"> <li>- HAVE PROFOUND KNOWLEDGE OF BASIC TECHNIQUES IN DATA ANALYSIS,</li> <li>- HAVE KNOWLEDGE AND UNDERSTANDING OF THE PROCEDURES TO DESIGN INDUSTRIAL EXPERIMENTAL TESTS,</li> <li>- UNDERSTAND AND EXPLAIN THE MEANING OF COMPLEX STATEMENTS USING STATISTICAL TOOLS;</li> <li>- UNDERSTAND THE FUNDAMENTAL CONCEPTS OF CRITERIA OF DESIGN OF EXPERIMENTS AND ITS USE IN SEVERAL INDUSTRIAL APPLICATIONS,</li> <li>- DEMONSTRATE SKILL IN THE USE OF STATISTICAL TOOLS AND ABILITY TO CARRY OUT DATA ANALYSIS,</li> <li>- DEMONSTRATE CAPACITY FOR READING AND UNDERSTAND OTHER TEXTS ON RELATED TOPICS.</li> </ul> |
| 3   | <b>Prerequisites and learning activities</b>                     | PREREQUISITES: MATHEMATICS; CHEMISTRY; APPLIED CHEMISTRY, PHYSICS; THE STUDENT MUST KNOW THE NOTIONS OF APPLIED STATISTICS TOOLS WITH PARTICULAR ATTENTION TO THE DESIGN OF INDUSTRIAL EXPERIMENTS   |
| 4   | <b>Teaching methods and language</b>                             | LECTURES AND EXERCISES. LANGUAGE: ITALIAN / ENGLISH<br><br><b>REF. TEXT BOOKS</b><br><br>MONTGOMERY, <i>DESIGN AND ANALYSIS OF EXPERIMENTS</i> , WILEY, 2012<br><br>SOME DIDACTIC MATERIALS AND SCIENTIFIC PAPERS PUBLISHED BY THE TEACHER   |
| 5   | <b>Assessment methods and criteria</b>                           | WRITTEN AND ORAL EXAMINATION, REALIZATION AND DISCUSSION OF A TECHNICAL REPORT REALIZED BY STUDENTS BEFORE THE FINAL EXAMINATION   |