Zał. nr 5 do ZW 79/2013

**COURSE DESCRIPTION**

TECHSummer School 2018

Course name: **QUALITY ENGINEERING**

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| *The course’s form* | ***Lecture*** | ***Tutorial*** | ***Laboratory*** | ***Project*** | ***Seminar*** |
| *Total number of hours*  | *20* |  |  | *15* | *10* |
| *Form of completion* | *exam* |  |  | *written report* | *oral presentation* |

* Initial requirements: statistics, basics in machine design
* Name, surname, title of teacher: Marek Młyńczak, Prof. WUST, Dr. Hab. Eng.
* Course’s aims and educational outcomes: knowledge related to importance of quality in mechanical systems design and operation. Students should have a knowledge about quality assessment techniques and be able to collect data, process it, chose suitable analytical approach to make quality assessment and apply it to make engineering decision in real technical system.
* Form of teaching (traditional / e-learning): traditional lecture, project and seminar
* Short description of the course content (max. 1200 characters):

Quality, understood as satisfaction of customer expectation, is measured and assessed on the basis of random, imperfect and uncertain variables. It is presented development of quality idea in engineering, standardisation and analytical assessment methods. Students should notice randomness and uncertainty in technical systems and processes, learn how to observe it, measure and evaluate. Sources of randomness related to design, manufacturing, operation, environment and human errors should be identified and described. Methods of quality improvement will be shown and advantages and disadvantages analysed. In particular, the following approaches are presented: 7 QC tools, 7 New Quality Management Tools, 5S Technique, Kaizen, Poka-Yoke, Quality Circle, Cost of Quality Technique, Introduction to Quality Management Standards – ISO: 9000, ISO:14000, QS:9000.

* Lecture – content:

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| Form of classes - lecture | Number of hours |
| 1 | Basic terms and definitions in machine operation. Concept of operation and life cycle. Systemic approach to technical object and its operation. | 2 |
| 2 | Operation process, up and down states, assessment measure, availability.  | 2 |
| 3 | Failure definition. Failure mode, causes, consequences and way of objects restoration.  | 2 |
| 4 | Failure, human error, environment impact as sources of hazards and quality depreciation. Quality, reliability and safety of technical object. | 2 |
| 5 | 7 QC tools, 7 New Quality Management Tools, 5S Technique, Kaizen, Poka-Yoke, Quality Circle, Cost of Quality Technique | 2 |
| 6 | Introduction to Quality Management Standards – ISO: 9000, ISO:14000, QS:9000. Safety standards EC 31000, 31010. | 2 |
| 7 | Total Quality Management: basic approach, ways of implementation, limitations, advantages. Idea of FMEA in design, process and manufacturing. HAZOP and HAZAN methods. | 2 |
| 8 | Sources of failures identification FTA/ETA methods. | 2 |
| 9 | Quality in manufacturing: Just in time (JIT) Concept, Lean Manufacturing, Agile Manufacturing, World Class Manufacturing, Total Productive Maintenance (TPM), Bench marking, Business Process Re-engineering (BPR), Six Sigma. OEE measure. | 2 |
| 10 | Quality in service sector. Quality assurance. Documentation. | 2 |

* Seminar – content: Students should present quality systems and results of examples of good practice in quality applications based on literature and internet.
* Project – content: Students are divided in groups of 4-6 and for a given technical system should apply one of lectured analytical quality assessment method to prove quality understanding and abilities of using learned knowledge.
* Basic literature:
1. Quality Assurance and Total Quality Management (ISO 9000, QS 9000 ISO 14000) by K C Jain and A K Chitale, Khanna Publishers
2. Quality Control & Application by B. L. Hanson & P. M. Ghare, Prentice Hall of India
3. Total Quality Management by Dale H. Besterfield, Carol Besterfield-Michna, Glen H. Besterfield and Mary Besterfield-Sacre, Pearson Educaiton
4. Quality Management by Kanishka Bedi
5. Total Quality Management – Dr. S. Kumar, Laxmi Publication Pvt. Ltd.
6. Total Quality Management by K C Arora, S K Kataria & Sons
7. Statistical Quality Control by M. Mahajan, Dhanpat Rai & Co. (P) Ltd.
* Completion rules: attendance above 70%, test, written exam, presentation of project results, oral presentation of the seminar subject.