



COURSE SPECIFICATION

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|--------------------------|---|
| Course code | B2-2-KB-009 |
| Course title in Polish | Bezpieczeństwo i niezawodność systemów konstrukcyjnych |
| Course title in English | Safety and reliability of structures |
| Valid from academic year | 2019/2020 |

CURRICULAR ALIGNMENT

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|--|---|
| Programme | CIVIL ENGINEERING |
| Level | second-cycle |
| Programme profile | academic |
| Mode of attendance | full-time |
| Specialism | Building Structures |
| Academic unit responsible for the course | Department of Mechanics, Metal Structures and Computer Methods |
| Course coordinator | dr inż. Agnieszka Dudzik |
| Approved by | prof. dr hab. inż. Marek Iwański |

COURSE DESCRIPTION

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|-------------------------|--------------------|
| Teaching block | specialism |
| Course status | required |
| Language of instruction | Polish |
| Semester of delivery | semester II |
| Prerequisites | - |
| Exam (YES/NO) | NO |
| ECTS | 3 |

| Mode of teaching | lecture | class | lab | project | seminar |
|------------------------------|-----------|-------|-----|-----------|---------|
| Number of hours per semester | 30 | | | 15 | |

LEARNING OUTCOMES

| Category | Code | Learning outcomes | Corresponding programme outcome code |
|----------|------|-------------------|--------------------------------------|
|----------|------|-------------------|--------------------------------------|

| | | | |
|------------|-----|--|--------|
| Knowledge | W01 | Students have knowledge of the influence of random limit load bearing capacity of structural elements. | B2_W01 |
| | W02 | Students know statistical analysis and reliability analysis of structural systems. | B2_W09 |
| Skills | U01 | Students can assess the safety of structures with critical elements connected in series and parallel. | B2_U17 |
| | U02 | Students can define a computational model and perform linear analysis. | B2_U06 |
| Competence | K01 | Students can work independently. | B2_K01 |
| | K02 | Students are responsible for the reliability of the results obtained. | B2_K02 |

COURSE CONTENT

| Teaching mode* | Topics covered |
|----------------|--|
| lecture | 1. Influence of physical material models on reliability models. Models of random ultimate strength distributions of materials and random ultimate bearing capacity of structural elements. Models of load distributions. |
| | 2. Deterministic and probabilistic measures of structural safety. |
| | 3. Estimation of ultimate bearing capacity parameters for structural elements. |
| | 4. Estimation of the reliability of statically determinate structures. |
| | 5. Determination of minimum critical sets of members of bar structures. |
| | 6. Reliability estimation of simple statically indeterminate structures with a single minimum critical set of critical elements. |
| project | 7. Reliability estimation of large statically indeterminate structural systems characterised by minimum critical sets including common critical elements. |
| | 1. Random bearing capacity of tensile elements. Reliability assessment of systems with critical series-connected elements. |
| | 2. Random bearing capacity of statically indeterminate structures. Reliability assessment of systems with critical parallel-connected elements. |

METHODS OF LEARNING OUTCOMES VERIFICATION

| Learning outcome | Learning outcome verification methods | | | | | |
|------------------|---------------------------------------|--------------|------|---------|--------|-------|
| | Oral exam | Written exam | Test | Project | Report | Other |
| W01 | | | X | X | | |
| W02 | | | X | X | | |
| U01 | | | X | X | | |
| U02 | | | X | X | | |
| K01 | | | X | X | | |
| K02 | | | X | X | | |

ASSESSMENT

| Teaching mode* | Assessment type | Criteria |
|----------------|-----------------|--|
| lecture | mark-based | <i>A passing grade or higher on the in-class test.</i> |
| project | mark-based | <i>A passing grade or higher on each project.</i> |

STUDENT WORKLOAD

| ECTS weighting | | | | | | | |
|----------------|--|------------------|---|---|----|---|------|
| | Activities | Student workload | | | | | Unit |
| | | W | C | L | P | S | h |
| 1. | Scheduled contact hours | 30 | | | 15 | | |
| 2. | Other (office hours, exams) | 2 | | | 2 | | h |
| 3. | Total number of contact hours | 49 | | | | | h |
| 4. | Number of ECTS credits for contact hours | 1,96 | | | | | ECTS |
| 5. | Independent study hours | 26 | | | | | h |
| 6. | Number of ECTS credits for independent study | 1,04 | | | | | ECTS |
| 7. | Practical hours | 28 | | | | | h |
| 8. | Number of ECTS credits for practical hours | 1,12 | | | | | ECTS |
| 9. | Total workload | 75 | | | | | h |
| 10. | ECTS credits for the course <i>1 ECTS credit = 25 student learning hours</i> | 3 | | | | | ECTS |

READING LIST

1. Biegus A.: „Probabilistyczna analiza konstrukcji stalowych”, PWN 1999.
2. Biegus A.: „Podstawy projektowania i oddziaływania na konstrukcje budowlane”, Oficyna Wydawnicza Politechniki Wrocławskiej, 2014.
3. Gwóźdź M, Machowski A.: Wybrane badania i obliczenia konstrukcji budowlanych metodami probabilistycznymi”, Wydawnictwo Politechniki Krakowskiej 2011.
4. Kowal Z.: Probabilistyczna optymalizacja nośności i niezawodności prętowych konstrukcji przestrzennych”, Konferencja Naukowo Techniczna ZK 2014 „Konstrukcje Metalowe”, Związek referatów, Kielce – Suchedniów 2-4 lipca 2014.

5. Radwańska-Skotniczy, Obciążenia budynków i konstrukcji budowlanych wg Eurokodów. PWN, Warszawa 2013
6. Kowal Z.: „Statyczne osłabienie i wzmocnienie konstrukcji”, Inżynieria i Budownictwo 7-8/1995.
7. Murzewski J.: „Niezawodność konstrukcji inżynierskich”, Arkady, Warszawa 1989.
8. Kowal Z.: „Oszacowanie bezpieczeństwa konstrukcji. Konwersatorium – Mechanika Stochastyczna”, Wrocław – Szklarska Poręba 1994, str. 17÷30.
9. PN-EN1990 Eurokod: Podstawy projektowania konstrukcji.