DESCRIPTION OF TRAINING PROGRAMME
FOT THE DOCTORAL SCHOOLAT THE KAZIMIERZ WIELKI UNIVERSITY

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<tr><td colspan="3" align="center">INFORMATION ON COURSE</td></tr>
<tr><td>Course</td><td colspan="2">Researcher's workshop I</td></tr>
<tr><td>Type of classes</td><td colspan="2">Specialist classes</td></tr>
<tr><td>Academic year</td><td colspan="2">2020/2021</td></tr>
<tr><td>Field of science</td><td colspan="2">Engineering and technology</td></tr>
<tr><td>Discipline of science</td><td colspan="2">mechanical engineering</td></tr>
<tr><td>Class instructor</td><td colspan="2">dr inż. Katarzyna Kazimierska-Drobny</td></tr>
<tr><td>Number of hours</td><td colspan="2">30</td></tr>
<tr><td>Forme of classes</td><td colspan="2">Lab</td></tr>
<tr><td>Pass rules</td><td colspan="2">credit with a grade</td></tr>
<tr><td>Language of lecture</td><td colspan="2">English</td></tr>
<tr><td>Framework learning outcomes (8 PRK)</td><td colspan="2">

- knows and understands to such an extent that is possible to revise existing paradigms – world heritage, including theoretical foundations, general issues and selected specific issues – specific to a scientific or artistic discipline
- knows and understands the main trends in the development of the scientific or artistic disciplines covered in the curricula
- knows and understands research methodology
- is able to critically analyse and evaluate the results of scientific research, expertise and other creative work and their contribution to knowledge development
- is able to use knowledge from different fields of science or art to creatively identify, formulate and innovatively solve complex problems or perform research tasks, in particular:
  - define the purpose and subject of scientific research, formulate a research hypothesis,
  - develop research methods, techniques and tools, and use them creatively,
  - draw conclusions on the basis of scientific research
- is ready for critical evaluation of the achievements of a given scientific or artistic discipline

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<tr><td colspan="3" align="center">DETAILED DESCRIPTION OF CLASSES</td></tr>
<tr><td>Particular learning outcomes</td><td colspan="2">

1. The student is able to identify tasks and draw conclusions of a research nature,
2. The student can define the character, structure and present a scientific work,
3. The student can indicate available computational methods and IT tools useful in solving research tasks.

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<tr><td colspan="3" align="center">Program content implemented during classes</td></tr>
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Bibliographic sources and methods of searching for scientific literature;
Assessment of the usefulness of scientific literature;
Representative types of scientific materials;
Analysis of the content of the work: motivational context, purpose and scope of the work, research methodology, visualization of results, presentation of conclusions.
Analysis of writing tools for scientific papers and preparing presentations; Presentations and discussion of examples.
Measurement uncertainty - basic definitions (measurement uncertainty, standard uncertainty,

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complex standard uncertainty, expanded uncertainty, coverage factor, standard uncertainty - type A method, standard uncertainty - type B method); Sources of measurement uncertainty; Uncertainty calculation (direct measurements, calculation of type A standard uncertainty, calculation of type B standard uncertainty, indirect measurements); Solving calculation examples using Matlab and Origin.
Visualization of research results using Matlab, Comsol and Origin.

Didactic methods	conversational exercises, discussion methods, methods of working with sources, contact through MS TEAMS applications
Assessmment methods and criteria	Assessment of papers, activity in the classroom, prepared written materials, a project on the calculation of measurement uncertainties
Passing rulet	credit with a grade
Basic literature	1. W.I.B. Beveridge, Sztuka badań naukowych, PZWL, 1960. 2. C. Cempel, Nowoczesne zagadnienia metodologii i filozofii badań: wybrane zagadnienia dla studiów magisterskich, podyplomowych i doktoranckich : poradnik. Poznań, Radom, ITE, 2005. 3. Norma ISO 17025:2017 4. ISO Guide to the Expression of Uncertainty in Measurement (GUM) – plik pdf ogólnodostępny w internecie 5. Evaluation of measurement data — Guide to the expression of uncertainty in measurement – ogólnodostępny w internecie 6. W. Sradowski, Matlab. Praktyczny podręcznik modelowania, Helion 2015, 7. Pratap Rudna, Matlab dla naukowców, PWN 2015.
Supplementary literature	1. Shoichiro Nakamura. Numerical Anlysis and graphic vizualization with Matlab. Printice-Hall, New Yersey 202. 2. Amos Gilat. Matlab. An Introduction with Application. Wiley ans sons 2005. 3. Edward B. Magrab. An Engineer's Guide to Matlab with Application from Mechanical. Aerospace, Electrical and Civil Engineering. . Printice-Hall, Upper Saddle River 2005. 4. Tabatabaian M. Comsol for Engineers. Mercury Learning and Information 2014; 5. Selected scientific publications, examples.

ATTACHMENT FOR DESCRIPTION OF TRAINING PROGRAMME

Course	Researcher's workshop I
Forme of classes	~~stationary / manual~~ / mixed model*
Methods and techniques distance learning	MS TEAMS application
Form and date of individual consultations *	Stationary in the Kopernika 1 building, room 209A
Form of passing of assessment / examination	1. ~~orally~~ / written 2. manual ~~/ stationary~~ project - from the calculations made