1. **Course title**: NUMERICAL METHODS
2. **Course code**
3. **Validity of course description**: 2012/2013
4. **Level of studies**: MA, MSc programme
5. **Mode of studies**: intramural studies
6. **Field of study**: ELECTRONICS AND TELECOMMUNICATION (FACULTY SYMBOL) AC, E & CS
7. **Profile of studies**: general
8. **Programme**:
9. **Semester**: 1
10. **Faculty teaching the course**: Institute of Electronics, Rau3
11. **Course instructor**: Ewa Straszeczka PhD, DSc
12. **Course classification**: common
13. **Course status**: compulsory
14. **Language of instruction**: English
15. **Pre-requisite qualifications**: foundations of numerical methods and computer programming at the level of S1 studies
16. **Course objectives**: providing knowledge and developing skills in advanced numerical methods applied in engineering practice
17. **Description of learning outcomes**:

<table>
<thead>
<tr>
<th>Nr</th>
<th>Learning outcomes description</th>
<th>Method of assessment</th>
<th>Teaching methods</th>
<th>Learning outcomes reference code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A student is provided with knowledge of using numerical algorithms to solve engineering problems in electronics.</td>
<td>Discussion of chosen problems during the lecture</td>
<td>Classical and multi-medial lecture</td>
<td>K2_W01</td>
</tr>
<tr>
<td>2</td>
<td>A student knows how to run standard numerical procedures in the form of toolboxes.</td>
<td>Evaluation of results of PC calculations during lab. exercises</td>
<td>Classical and multi-medial lecture</td>
<td>K2_W01</td>
</tr>
<tr>
<td>3</td>
<td>A student can link numerical methods and artificial intelligence methods.</td>
<td>Evaluation of results of solution of problems during lab. exercises</td>
<td>Laboratory exercises</td>
<td>K2_U1</td>
</tr>
<tr>
<td>4</td>
<td>A student is able to solve an engineering problem by means of PC and provided software.</td>
<td>Evaluation of results of PC calculations during lab. exercises</td>
<td>Laboratory exercises</td>
<td>K2_U2, K2_U3</td>
</tr>
<tr>
<td>5</td>
<td>A student is able to prepare a documentation of a problem solution and to formulate conclusions.</td>
<td>Evaluation of an exercise report</td>
<td>Laboratory exercises</td>
<td>K2_U3, K2_U6</td>
</tr>
</tbody>
</table>

18. **Teaching modes and hours**

Lecture / BA/MA Seminar / Class / Project / Laboratory

lecture - 15 h., laboratory - 15 h.

19. **Syllabus description**:

**Lecture**

Operations and calculations on matrices, special types of matrices, spline interpolation, reducing errors of interpolation, clustering methods: classical and fuzzy, linear discriminant analysis and its use for classification, data modeling – statistics and features of data sets, data mining - drawing knowledge from data, linking C/C++ and Matlab procedures.

**Laboratory – exercises**

1) Matrix inversion, determinant and tridiagonal matrices
2) Spline interpolation
3) Clustering methods
4) Linear discriminant analysis - Fisher linear analysis
5) Data modeling
6) Linking programs in C/C++ with Matlab environment

20. Examination: no exam

21. Primary sources:
   2. A. Ralston, P. Rabinowitz – The first course in numerical analysis, Dover Publications 2001

22. Secondary sources:
   2. E. Straszecka & oth. – Laboratorium metod numerycznych, skrypt Politechniki Śląskiej nr 2197, (in Polish)

23. Total workload required to achieve learning outcomes

<table>
<thead>
<tr>
<th>Lp.</th>
<th>Teaching mode</th>
<th>Contact hours / Student workload hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lecture: 15/5</td>
</tr>
<tr>
<td>2</td>
<td>Classes</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Laboratory</td>
<td>15/15</td>
</tr>
<tr>
<td>4</td>
<td>Project</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>BA/MA Seminar</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Other</td>
<td>5/5</td>
</tr>
<tr>
<td></td>
<td>Total number of hours</td>
<td>35/25</td>
</tr>
</tbody>
</table>

24. Total hours: 60

25. Number of ECTS credits: 2

26. Number of ECTS credits allocated for contact hours: 1

27. Number of ECTS credits allocated for in-practice hours (laboratory classes, projects): 1

26. Comments:

Approved:

……………………………..
(date, Instructor’s signature)

……………………………..
(date, the Director of the Faculty Unit signature)