

COURSE SPECIFICATION FORM,
approved by the Academic Council 17.06.2015 (#39)

SECTION A: DEFINITIVE

Items in this section may be reviewed and developed within Schools as part of the Annual Program Monitoring Process and in line with the Guidelines to Modifications to Programs and Courses.

1. General course information			
1.1	School: SST	1.6	Credits (ECTS): 6
1.2	Course Title: Computational Modeling and Simulation	1.7	Course Code: PHYS511
1.3	Pre-requisites: MS level standing	1.8	Effective from: 2018 (year)
1.4	Co-requisites:		
1.5	<p style="text-align: center;"><u>M.S. in Physcs</u></p> <input checked="" type="checkbox"/> Core <input type="checkbox"/> Elective Programs: <i>(in which the course is offered)</i>		
2. Course description (max.150 words)			
In this course, students advance in modeling techniques and master simulation skills. The course encompasses general methods for scientific computer simulation building and the results validation as well as the analysis of the simulated data.			
3. Summative assessment methods (tick if applicable):			
3.1	Examination <input type="checkbox"/>	3.5	Presentation <input type="checkbox"/>
3.2	Term paper <input type="checkbox"/>	3.6	Peer-assessment <input type="checkbox"/>
3.3	Project <input type="checkbox"/>	3.7	Essay <input type="checkbox"/>
3.4	Laboratory Practicum <input checked="" type="checkbox"/>	3.8	Other (<i>specify</i>) _____
4. Course aims			
1) Acquire the basic skills for numerically solving mathematical problems that appear in physics and other areas of science and engineering 2) The advantages and limitations of common numerical techniques 3) Practice writing flexible, efficient, and practical code in a modern language Python 4) Get acquainted with modern software development tools and systems 5) Learn how to use popular numerical libraries 6) Learn common techniques for analyzing and plotting data 7) Practice writing reports in the scientific style			
5. Course learning outcomes (CLOs)			
5.1	By the end of the course the student will be expected to be able to: 1) Have profound knowledge of numerical methods for solving mathematical problems that appear in physics and other areas of science and engineering 2) Write flexible, efficient, and practical code in a modern language Python 3) Analyze and plot data 4) Write reports in a scientific style.		
5.2			

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CLO ref #	Program Learning Outcome(s) to which CLO is linked	Graduate Attribute(s) to which CLO is linked
1	1,2,3,4	Possess an in-depth and sophisticated understanding of their domain of study;
2	1,2,5,6	Intellectually agile, curious, creative, and open-minded;
3, 4	1,2,3,7	Fluent and nuanced communicators across languages and cultures;

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SECTION B: NON-DEFINITIVE

Course Syllabus Template

Details of teaching, learning and assessment

Items in this Section should be considered annually (or each time a course is delivered) and amended as appropriate, in conjunction with the Annual Program Monitoring Process. The template can be adapted by Schools to meet the necessary accreditation requirements.

6. Detailed course information				
6.1	Academic Year: 2018	6.3	Schedule (class days, time): Mon, Wed, and Fri, 16:00-16:50	
6.2	Semester: Fall	6.4	Location (building, room): 7.212	
7. Course leader and teaching staff				
	Position	Name	Office #	Contact information
	Course Leader	E. Abdikamalov, S. Bubin	7e.336 7e.333	ernazar.abdikamalov@nu.edu.kz , 4662
	Course Instructor(s)			
	Teaching Assistant(s)			
8. Course Outline				
	Session	Date (tentative)	Topics and Assignments	Course Aims (ref. # only, see item 4)
		Week 1	Introduction to Python	1-7
		Week 2	Approximation and Numerical Errors	1-7
		Week 3	Roots of Equations	1-7
		Week 4	Linear Algebraic equations	1-7
		Week 5-6	Least-Squares Regression, Interpolation	1-7
		Week 7-8	Numerical linear algebra with LAPACK.	1-7
		Week 9-10	Discretization of differential operators. Solving simple PDEs using numerical grids.	1-7
		Week 11	Ritz-Galerkin method	1-7
		Week 12	Introduction to parallel programming with OpenMP	1-7
		Week 13	Introduction to parallel programming with MPI	1-7
9.	Learning and Teaching Methods (briefly describe the approaches to teaching and learning to be employed in the course)			
1	Lectures (covering computational techniques and coding methods)			
2	Practical lab demonstrations			
3	Assignment feedback by instructor			
10. Summative Assessments				
	#	Activity	Date (tentative)	Weighting (%)
				CLOs

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	Assignments	Every week	100%	1,2,3,4
11. Grading				
	Letter Grade	Percent range	Grade description (where applicable)	
According to NU grading policies.				
12. Learning resources (use a full citation and where the texts/materials can be accessed)				
	E-resources, including, but not limited to: databases, animations, simulations, professional blogs, websites, other e-reference materials (e.g. video, audio, digests)	https://www.python.org/ https://matplotlib.org/ https://stackoverflow.com http://www.netlib.org/		
	E-textbooks	Computational Physics with Python, M. Newman. Available at www-personal.umich.edu/~mejn/computational-physics/		
	Laboratory physical resources	Use of the computer lab in a free time is allowed		
	Special software programs	Python Programming Language 3.5 or later. Jupyter notebook GNU compiler collection Most of necessary software are included in the Anaconda Package available for free (www.anaconda.com)		
	Journals (inc. e-journals)			
	Text books	<ol style="list-style-type: none"> 1. Numerical Methods for Engineers, Steven C. Chapra, Raymond P. Canale, 6th edition, McGraw-Hill, 2010 2. Computational Physics with Python, Mark Newman, CreateSpace Independent Publishing Platform, 2012 3. Numerical Recipes, 3rd. edition, by W. H. Press, S. Teukolsky, W. Vetterling, and B. Flannery, Cambridge University Press, Cambridge, UK, 2007 		
13. Course expectations				
<p>Attendance policy Students are expected to attend all lectures, as participation in every class activities is the integral part of the class. Failure to do so without valid excuse will result in the final grade reduction of one division (e.g. A to A-, etc) per each class missed.</p> <p>Office Hours Policy Every student is encouraged to visit my office hours. It is mandatory for students to come to office hours at least once before their presentation date. Please set up the appointments with me if current office hours are in conflict with your other academic endeavors.</p> <p>Class participation</p>				

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Students must participate in class discussions and provide peer feedback.

Classroom decorum

No food or drinks are allowed in the classroom. All the electronic devices (such as laptops, cell phones, etc) should be turned off during lecture and labs, unless otherwise instructed.

Late-to-class policy

Please be on-time. The presentation will start promptly each class so being more than 5 minutes late without a valid excuse will count as absence!

Electronic resources

Students are expected to regularly check your Nazarbayev University email and Moodle course page.

14. Academic Integrity Statement

You are welcome and encouraged to get assistance on your presentation from your fellow students, professors and other sources. However, the work you present should be your own and reflect your own understanding of the subject. All material from outside sources should be properly referenced. Anyone intentionally violating these guidelines will fail the course and will be charged with academic dishonesty and subject to NU's disciplinary procedures described in Student Code of Conduct and Disciplinary Procedures (approved by the AC on 05.02.2014), specifically, paragraphs 13-16 (plagiarism and cheating).

15. E-Learning

If the content of the course and instruction will be delivered (or partially delivered) via digital and online media, consult with the Head of Instructional Technology to complete this section and/or provide a separate document complementary to this Template.

16. Approval and review

Date of Approval: 11/12/2017	Minutes #: 31	Committee: D. Beznosko, T. Oikonomou
Date(s) of Approved Change:	Minutes #:	Committee: