

KURSPLAN

Pathway for Natural Sciences, 37,5 högskolepoäng*Pathway for Natural Sciences, 37.5 credits*

Kurskod:	PNSX00	Utbildningsnivå:	Grundnivå
Fastställd av:	Utbildningsrådet 2019-04-08	Utbildningsområde:	Naturvetenskapliga området (80%) och samhällsvetenskapliga området (20%)
Gäller fr.o.m.:	2020-01-13	Ämnesgrupp:	NA9
Version:	1	Fördjupning:	GXX

Lärandemål

On successful completion of the Pathway for Natural Sciences students will be able to:

Kunskap och förståelse

1. Display knowledge of polynomial-, power-, exponential- and trigonometric functions
2. Display knowledge of the concept of the geometric sum and of linear optimization
3. Display knowledge of radians
4. Display knowledge of numerical methods to calculate integrals
5. Display knowledge of the structure of the atom and chemical bonds
6. Show familiarity with some elementary acid-base reactions
7. Demonstrate comprehension of energy changes in chemical reactions
8. Demonstrate comprehension of oxidation-reduction reactions and of some of their applications
9. Show familiarity with risks of working in a laboratory
10. Demonstrate knowledge of physical quantities and units
11. Demonstrate an understanding of the concepts of force and energy
12. Demonstrate an understanding of the concepts of electromagnetism
13. Demonstrate knowledge of atomic physics
14. Understand the main content and essential details of English spoken at a relatively rapid pace, and in written English of various genres, and in more formal contexts
15. Know general principles of academic writing and formal composition
16. Know how to plan and deliver a formal presentation in English using rhetorical principles
17. Know how to apply and use a range of academic study techniques and language strategies

Färdighet och förmåga

18. Demonstrate ability to transform and simplify algebraic expressions
19. Demonstrate skills of solving equations of various sorts
20. Demonstrate skills of calculating derivatives and basic integrals involving the above-mentioned elementary functions
21. Demonstrate ability to use derivatives in order to analyze the properties of a given function

and to methodically solve optimization problems

22. Demonstrate ability to transform and simplify rational expressions
23. Demonstrate skills of using trigonometric formulas to solve problems for triangles
24. Demonstrate skills of solving trigonometric equations
25. Demonstrate ability to transform and simplify trigonometric expressions
26. Demonstrate skills of using integrals to solve geometrical problems
27. Show ability to search information about labelling and handling of chemicals
28. Show ability to handle laboratory equipment, to perform experiments and interpret and process the results
29. Demonstrate ability to perform calculations in stoichiometry
30. Demonstrate ability to perform simple ph calculations
31. Demonstrate ability to write and interpret chemical formulas for some chemical compounds and reactions
32. Demonstrate skills in using experimental methods in laboratory
33. Show ability to apply newton's laws and conservation of energy
34. Demonstrate skills in using the concepts of torque, momentum, impulse, pressure, heat, temperature, electrostatic forces and fields in calculations
35. Demonstrate skills in calculating current, voltage, potentials and resistance in dc circuits
36. Demonstrate skills in applying the special theory of relativity
37. Demonstrate skills to interpret and carry out basic calculations in nuclear physics
38. Show ability to solve problems concerning motion in two dimensions
39. Show ability to apply theory concerning mechanical oscillations and waves
40. Show ability to perform calculations on electric- and magnetic fields
41. Demonstrate skills concerning electromagnetic induction and alternating currents
42. Demonstrate skills concerning electromagnetic waves and their properties
43. Show ability to solve problems concerning the electron structure of atoms
44. In oral and written production and interaction in English students will demonstrate the ability to present and discuss information accurately and clearly with some adaptation to purpose, recipient and situation.
45. Carry out effective research based on different research methods, using a range of sources, and critically assess and evaluate these.
46. Participate actively in classroom activities and be able to perform a range of task both individually and in a group setting.
47. Be familiar with different aspects of Scandinavian society and culture.

Värderingsförmåga och förhållningssätt

48. Self and peer reflection on the development of skills and abilities.
49. Critical evaluation of relevant information related to the different parts of the course.

Innehåll

The Pathway for Natural Sciences course is a preparatory course for students who do not meet the level of required Mathematics, Physics and Chemistry for University studies in Sweden.

A horizontal aim is to develop and strengthen student skills within higher education through group work, social engagement, peer learning, reflective learning and autonomous learning whilst developing intercultural communication skills, metacognitive skills, information literacy and critical thinking.

The purpose of the course is to provide post-secondary supplementary Mathematics, Physics and Chemistry education in which the content corresponds to the content of Swedish upper secondary school courses Mathematics 3b and 3c, Physics 1 and Physics 2 and Chemistry 1 as a pathway to a programme at Jönköping University.

The purpose is also to prepare students for Higher Education in Sweden by giving support in adjusting to the demands, challenges and expectations of Swedish Higher Education.

The course consists of six sub-courses; Pathway Mathematics 1, Pathway Mathematics 2, Pathway Chemistry, Pathway Physics 1, Pathway Physics 2 and Pathway Academic English. Knowledge will be gained through lectures, assignments, laboratory exercises and mentoring sessions. Weekly tasks will be set and marked to track progress.

Sub Courses

Pathway Mathematics 1, 7,5 hp

The course includes the following elements:

- Basic algebra
- Geometric sums
- Studies of polynomial, power and exponential functions
- Logarithms
- Derivatives and differentiation rules for the functions mentioned above
- Applications using the derivative to solve optimization problems
- Integrals

Pathway Mathematics 2, 3,5 hp

The course includes the following elements:

- Trigonometric formulas and identities
- Introduction to trigonometric functions
- Vectors

Pathway Chemistry, 5,0 hp

The course includes some basic chemical concepts about the structure and the functions of the matter, the transformations of the substances within chemical reactions and the importance of Chemistry to people and societies.

The course includes the following elements:

- The risks of work in a laboratory including labeling and handling of chemicals
- Matter and chemical bonding

- Chemical formulas and calculations
- Energy changes in chemical reactions
- Acids and bases
- Redox reactions and electrochemistry
- Analytical chemistry

Pathway Physics 1, 8,0 hp

The course introduces the basic physics and the science of working with experiments, analysis and interpretation of measurements using models. In addition, the course will provide familiarity with the use of mathematical concepts in physics and algebraic handling of formulas and expressions.

The course includes the following topics:

- Units and unit conversions, vectors and scalars, the SI-system
- Velocity and speed, acceleration, laws of motion with constant acceleration
- Newton's laws, normal force, gravitational force, Hooke's Law, friction, inclined plane
- Work, potential energy, kinetic energy, power and efficiency, conservation of energy
- Momentum, conservation of momentum, impulse, elastic and inelastic collisions
- Density, pressure, pressure in liquids, Archimedes' principle
- Thermodynamics; pressure in gases, the ideal gas law, phase transitions and calorimetry
- Electric charges and forces, electric fields, electric current, voltage and potentials, resistance and resistivity, electrical energy and power
- DC circuits, series and parallel circuits involving resistors
- Nuclides, nuclear reactions, activity and half-life, ionizing radiation
- The special theory of relativity, light speed, time dilation and length contraction, relativistic energy

Pathway Physics 2, 6,0 hp

The course introduces additional basic physics and principles of scientific work with experiments, analysis and interpretation of measurements using models. More mathematical concepts in physics are introduced and applied.

The course includes the following topics:

- Torque with application to static balance
- Motion in two dimensions; projectile motion, circular motion and the centripetal force
- Mechanical oscillations and waves; springs, pendulums, resonance
- Sound and properties of sound waves, sound level
- Electric and magnetic fields; capacitance and the capacitor, magnetic flux and magnetic field strength, charged particles in magnetic fields, the Biot-Savart law, electromagnetic induction, Lenz' law, coils, electromotive force, Faraday's law of induction
- Alternating currents; the generator, the transformer, AC circuits with capacitor and coil, self inductance
- Light as electromagnetic waves; the electromagnetic spectrum, reflection, refraction and Snell's

law, diffraction, interference

- Atomic physics; photons, properties of atomic electron structure, absorption and emission, emission spectra, the photoelectric effect

Pathway Academic English, 7,5 hp

The course consists of lectures, seminars and group activities in various fields of academic English and has been designed specifically to meet the needs of non-native English speakers who wish to develop their English language competencies and be able to communicate effectively in an academic environment. In addition to the development of the four main areas of language (reading, writing, speaking and listening), there is also a strong focus on academic skills including research ethics, critical thinking, academic writing and presentations. English will be taught in an international context with a strong focus on active participation and group discussion. Students will be given opportunities to share their own experiences and in turn gain a deeper knowledge of living conditions, social issues and cultural features in different parts of the world.

Course content and objectives include:

- Applied grammar (individualised)
- Vocabulary building - academic language. Both general and subject specific.
- Academic reading
- Listening comprehension
- Academic writing - summary writing, research papers, essays
- Language strategies
- Oral proficiency - presentation, group discussion and debating skills, pronunciation
- Introduction to rhetoric - the art of persuasive speaking and writing

Undervisningsformer

Lectures, laboratory exercises and mentoring sessions.

Undervisningen bedrivs på engelska.

Förkunskapskrav

High School Diploma and English language skills corresponding to:

IELTS 6.5 or the equivalent

Mathematics 2a, 2b, 2c or the equivalent

Examination och betyg

Kursen bedöms med betygen Underkänd eller Godkänd.

The examination consists of written assignments, laboratory experiments and written exams. Active participation throughout the course is required.

Poängregistrering av examinationen för delkursen 'Pathway Mathematics 1' sker enligt följande system:

Examinationsmoment	Omfattning	Betyg
Pathway Mathematics 1 - Written exam ¹	7,5 hp	U/G

¹ ILOs: 1, 2, 4, 18-22, 26

Poängregistrering av examinationen för delkursen 'Pathway Mathematics 2' sker enligt följande system:

Examinationsmoment	Omfattning	Betyg
Pathway Mathematics 2 - Written exam ¹	3,5 hp	U/G

¹ ILOs: 1, 3, 23-25

Poängregistrering av examinationen för delkursen 'Pathway Chemistry' sker enligt följande system:

Examinationsmoment	Omfattning	Betyg
Pathway Chemistry - Written exam ¹	4 hp	U/G
Pathway Chemistry - Laborations ²	1 hp	U/G

¹ ILOs: 5-8, 29-32

² ILOs: 9, 27, 28

Poängregistrering av examinationen för delkursen 'Pathway Physics 1' sker enligt följande system:

Examinationsmoment	Omfattning	Betyg
Pathway Physics 1 - Written exam ¹	6 hp	U/G
Pathway Physics 1 - Laborations ²	2 hp	U/G

¹ ILOs: 10, 11, 33-37

² ILOs: 9, 27, 32

Poängregistrering av examinationen för delkursen 'Pathway Physics 2' sker enligt följande system:

Examinationsmoment	Omfattning	Betyg
Pathway Physics 2 - Written exam ¹	4 hp	U/G
Pathway Physics 2 - Laborations ²	2 hp	U/G

¹ ILOs: 12, 13, 37-43

² ILOs: 9, 27, 42

Poängregistrering av examinationen för delkursen 'Pathway Academic English' sker enligt följande system:

Examinationsmoment	Omfattning	Betyg
Pathway Academic English - Academic paper ¹	4 hp	U/G

Pathway Academic English - Oral presentation ²	2 hp	U/G
Pathway Academic English - Life and Studies in Scandinavia ³	1,5 hp	U/G

¹ ILOs: 14-15, 17, 44-45, 48-49

² ILOs: 16, 44, 46, 48-49

³ ILOs: 47-49

Övrigt

Qualification Requirements

To obtain the Course Certificate the student shall complete the course requirements of 37.5 credits where 7.5 credits constitute Pathway Mathematics 1, 3.5 credits constitute Pathway Mathematics 2, 5 credits constitute Pathway Chemistry, 8 credits constitute Pathway Physics 1, 6 credits constitute Pathway Physics 2 and 7.5 credits constitute Pathway Academic English. Active participation required in lectures, workshops, assignments, laboratory exercises and tutorials is compulsory in order to meet the requirements of the course.

Continuation Requirements

Students who successfully complete the Pathway for Natural Science, 37.5 credits, may, if preselected and eligibility assessed, without any further testing enter:

- The Bachelor program Sustainable Supply Chain Management at JU
- The Bachelor program Prosthetics and Orthotics at JU

Title of qualification

The course gives you a Course Certificate demonstrating skills equivalent to the corresponding requirements of Swedish upper secondary school courses Mathematics 3b and 3c, Physics 1, Physics 2 and Chemistry 1, qualifying you for admission to a specific programme at Jönköping University.

Kurslitteratur

Pathway Mathematics 1 & 2

Ibrahim Wazir, Tim Garry: *Pearson Baccalaureate, Standard Level Mathematics*, 2012 edition, ISBN: 9780435074975. Pearson 2012.

<https://openstax.org/subjects/math>

Additional handouts from JU

Pathway Physics 1 & 2

Openstax College Physics, <https://openstax.org/details/books/college-physics>

Additional handouts from JU

Pathway Chemistry

<https://openedgroup.org/books/Chemistry.pdf>

<https://www.ck12.org/c/chemistry/> (web material linked to the pdf above)

<https://openstax.org/details/books/chemistry>

Additional handouts from JU

Pathway Academic English

All reference books and work books are provided on an individual and whole class basis. Bespoke teaching materials and handouts for English and Life and Studies will be distributed by the class teacher or lecturer.