Федеральное государственное бюджетное образовательное учреждение
высшего образования
«Московский государственный университет имени М.В. Ломоносова»
Механико-математический факультет

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«_______» ________ 20_____ г.

РАБОЧАЯ ПРОГРАММА ДИСЦИПЛИНЫ

«Иностранный язык»

Foreign Language

Программы подготовки научных и научно-педагогических кадров в аспирантуре:

«Математика и механика»
«Компьютерные науки и информатика»
«Информационные технологии и телекоммуникации»

Москва 2023

Рабочая программа дисциплины «Иностранный язык» разработана в соответствии с Образовательным стандартом высшего образования, самостоятельно устанавливаемым Московским государственным университетом имени М.В. Ломоносова, для подготовки кадров высшей квалификации.

1. Краткая аннотация:

Название дисциплины – «Иностранный язык».

Цель изучения дисциплины – развитие навыков перевода и анализа неадаптированной научной литературы по специальности на английском языке для использования полученной информации в собственных научных исследованиях; развитие навыков подготовки и представления научного доклада по специальности на английском языке; развитие навыков написания собственной научной статьи на английском языке для публикации в международных научных изданиях.

2. Уровень высшего образования – подготовка научных и научно-педагогических кадров в аспирантуре.

3. Научные специальности, для которых реализуется данная программа – 1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.9, 1.1.10, 1.2.2, 1.2.3, 2.3.5, 2.3.6. **Области науки:** математика и механика, компьютерные науки и информатика, информационные технологии и телекоммуникации.

4. Место дисциплины в структуре Программы аспирантуры: дисциплина «Иностранный язык» входит в образовательную компоненту и является обязательной для освоения не позднее второго года обучения.

5. Объем дисциплины «Иностранный язык» составляет **5 зачетных единиц**[1], всего **180 академических часов**, из которых: 140 часов составляет контактная работа аспиранта с преподавателем (в том числе 120 часов – практические занятия семинарского типа, 2 часа – групповые консультации перед экзаменом, 18 часов – индивидуальные консультации), 10 часов – мероприятия текущего контроля успеваемости и промежуточной аттестации, 30 часов составляет самостоятельная работа учащегося, направленная на подготовку к экзамену.

6. Входные требования для освоения дисциплины, предварительные условия.

Обучающийся, приступающий к освоению дисциплины «Иностранный язык» для аспирантов, должен владеть: 1) иностранным языком на уровне не ниже уровня B2 по шкале уровней владения языками CEFR; 2) терминологией по специальности «Фундаментальная математика и механика»; 3) навыками чтения, перевода и реферирования неадаптированных аутентичных текстов по специальности; 4) навыками говорения на знакомые темы, построения монологического высказывания, подготовки научного доклада, участия в беседе и научной дискуссии; 5) навыком понимания звучащей аутентичной английской речи на уровне не ниже B2.

На предыдущих уровнях высшего образования должны быть освоены общие курсы:

1. «Иностранный язык» (уровень высшего образования – специалист/ магистр).

2. «Иностранный язык: методика подготовки научных докладов и ведения дискуссий» (уровень высшего образования – специалист).

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[1] Согласно нормативам, устанавливаемым Министерством науки и высшего образования РФ, Образовательному стандарту высшего образования, самостоятельно устанавливаемому МГУ имени М.В. Ломоносова, для подготовки кадров высшей квалификации.

7. Содержание дисциплины, структурированное по темам.

Наименование и краткое содержание разделов и тем дисциплины, форма промежуточной аттестации по дисциплине	**Всего (часы)**	В том числе							
		Контактная работа (работа во взаимодействии с преподавателем), часы из них						**Самостоятельная работа обучающегося, часы** из них	
		Занятия лекционного типа	Занятия семинарского типа	Групповые консультации	Индивидуальные консультации	Учебные занятия, направленные на проведение текущего контроля успеваемости, промежуточной аттестации	**Всего**	Подготовка к экзамену	**Всего**
Раздел 1. *Английский язык научного текста по специальности.*	**32**		30			2	**32**		
Раздел 2. *Письменный перевод научного текста по специальности.*	**26**		10		6		**16**	10	**10**
Раздел 3. *Английский язык научного доклада по специальности.*	**32**		30			2	**32**		
Раздел 4. *Подготовка научного доклада по специальности.*	**36**		20		6		**26**	10	**10**
Раздел 5. *Написание*	**46**		30		6		**36**	10	**10**

собственной научной статьи по специальности.									
Промежуточная аттестация: *экзамен*	**8**			2		6	8		
Итого:	**180**		**120**	**2**	**18**	**10**	**150**		**30**

Обучение всем формам устного и письменного общения на английском языке ведется комплексно с учетом фонетических, лексических и грамматических норм современного английского языка. В качестве учебных текстов используется аутентичная монографическая и периодическая литература по широкому профилю факультета и по узкой специальности аспиранта.

8. Образовательные технологии. Практические занятия семинарского типа проводятся с использованием интерактивных средств и предполагают выполнение заданий исследовательского характера (подготовка научного доклада, написание математической статьи), а также участие аспирантов в научной дискуссии.

9. Учебно-методические материалы для самостоятельной работы по дисциплине «Иностранный язык» размещены на сайте кафедры английского языка механико-математического факультета (в разделах «Аспиранту» и «Библиотека»). Кроме того, в рамках самостоятельной работы обучающимся необходимо прочесть 300 страниц научной литературы по специальности, рекомендованной научным руководителем, а также самостоятельно подготовить ряд письменных работ по прочитанному, а именно: письменный перевод отрывка из прочитанной литературы по специальности с английского языка на русский (объемом 15 000 знаков), словарь-минимум терминов изучаемой специальности, словарь общенаучных выражений, – а также подготовить три устных доклада по научным аспектам, рассмотренным в рекомендованной литературе. Помимо этого, в рамках самостоятельной работы аспиранты готовят научный доклад по дипломной работе на английском языке, пишут собственную научную статью по специальности (на английском языке) и готовят по ней научный доклад (также на английском языке) с использованием современных технологий (компьютерной презентации). Все вышеперечисленные работы проходят обсуждение со специалистом по математике/ механике на экзамене кандидатского минимума по иностранному языку.

10. Ресурсное обеспечение:

- Перечень основной и дополнительной учебной литературы ко всему курсу.

Основная литература:

1. Александров П.С. Англо-русский словарь математических терминов. – М.: Мир, 1994.
2. Аркадьевская К.А. Пособие для развития навыков письменной речи научного характера на английском языке. – М.: Издательство Московского университета, 1988.
3. Выгонская Л.Н. Focus on Scientific English. – М.: Издательство механико-математического факультета МГУ и Центра прикладных исследований, 2004.
4. Выгонская Л.Н., Григорьева И.А. Английский язык для механиков и математиков. – М.: МАКС Пресс, 2014.
5. Карпова Л.С. Практическое пособие по подготовке научных докладов по математике на английском языке/ A Practical Guide to Giving a Talk on Mathematics / Под ред. Л.Н. Выгонской. – М.: МАКС Пресс, 2019.
6. Корнеева М.С., Перекальская Т.К. Учебное пособие по развитию навыков аннотирования и реферирования. – М.: Издательство Московского университета, 1993.
7. Корнеева М.С., Е.А. Маренкова, Т.К. Перекальская. Пособие по реферированию научных текстов. – М.: Издательство Московского университета, 1983.
8. Ловатер А. Русско-английский словарь математических терминов. – 2-е изд. – 1990.
9. Савченко А.А. Writing Maths. Quotations: учебно-методическое пособие. [Электронный ресурс: http://www.eng.math.msu.su/writing_math.pdf].
10. Сосинский А.Б. Как написать математическую статью по-английски. – М.: Издательство МК НМУ, 1994.

Дополнительная литература:

1. Перекальская Т.К. An Introduction to Scientific Communication. – М.: Издательство механико-математического факультета МГУ и Центра прикладных исследований, 2002.
2. Выгонская Л.Н., Корнеева М.С., Миндели Е.И. Неличные формы глагола в научном тексте. – М.: МАКС Пресс, 2013.
3. Chang, L. Handbook for Spoken Mathematics. Lawrence Livermore Laboratory, 1983.
4. Collins dictionary of Mathematics / ed. by E.J.Borowski, J.M.Borwein. 2 ed. 2007.
5. English for Academics. Cambridge University Press. Book I, 2014; Book II, 2015.
6. Gilman, Leonard. Writing Mathematics Well. The Mathematical Association of America, 1987.
7. Gross D. Some Hints on Mathematical Style. [Электронный ресурс: http://www.eng.math.msu.su].

8. Grussendorf M. English for Presentations. OUP, 2011.
9. Halmos P.R. How to Talk Mathematics. Notices of AMS, 21:3 155-158, 1974.
10. Higham, Nicholas J. Handbook of Writing for Mathematical Sciences. S&AM, 1961.
11. McCarthy Michael, O’Dell Felicity. Academic Vocabulary in Use. Cambridge University Press, 2008.
12. Oxford Learner’s Dictionary of Academic English. Oxford University Press, 2014.
13. Trzeciak, Jerzy. Writing Mathematical Papers in English. European Mathematical Society Publishing House, 1995.
14. Wallwork A. English for Presentations at International Conferences. Springer, 2010.
15. Wallwork A. English for Research: Usage, Style, and Grammar. Springer, 2013.

- Перечень информационных справочных ресурсов, доступных в сети Интернет:
  http://www.oxfordlearnersdictionaries.com/
  http://dictionary.cambridge.org/
  http://www.pearsonlongman.com/dictionaries/
  http://www.oxfordreference.com/view/10.1093/acref/9780199235940.001.0001/acref-9780199235940

- Описание материально-технической базы. Занятия проводятся с использованием аудио- и видеотехники.

11. Язык преподавания: русский, английский.

12. Преподаватели:

1) Заведующий кафедрой, доцент, к.ф.н. Л. С. Карпова: lyubov.karpova@math.msu.ru, +7(495) 939-39-28.
2) Доцент, доцент, к.ф.н. О. В. Корецкая: olga.koretskaya@math.msu.ru, +7(495) 939-39-28.
3) Доцент, доцент, к.ф.н. Е. И. Миндели: elena.mindeli@math.msu.ru, +7(495) 939-39-28.
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5) Доцент, доцент, к.ф.н. Л. Л. Степанян: lolitta.stepanyan@math.msu.ru, +7(495) 939-39-28.
6) Доцент Е. Н. Егорова: elena.egorova@math.msu.ru, +7(495) 939-39-28.
8) Старший преподаватель А. А. Савченко: alexander.savchenko@math.msu.ru, +7(495) 939-39-28.
9) Старший преподаватель Л. И. Шумихина: liudmila.shumikhina@math.msu.ru, +7(495) 939-39-28.

Фонды оценочных средств необходимые для оценки результатов обучения

Образцы домашних заданий

1. ***Переведите текст на русский язык и проведите его лексико-грамматический анализ.***

ALGORITHMIC ADVANCEMENTS[2]

Many modern results on large numbers have depended on algorithms from seemingly unrelated fields. One example that could fairly be called the workhorse of all engineering algorithms is the Fast Fourier Transform (FFT). The FFT is most often thought of as a means for ascertaining some spectrum, as is done in analyzing birdsongs or human voices or in properly tuning an acoustic auditorium. It turns out that ordinary multiplication – a fundamental operation between numbers – can be dramatically enhanced via FFT. Arnold Schoenage of the University of Bonn and others refined this astute observation into a rigorous theory during the 1970s.

FFT multiplication has been used in celebrated calculations of π to a great many digits. Granted π is not a bona fide large number, but to compute π to millions of digits involves the same kind of arithmetic used in large-number studies. In 1985 R. William Gosper, Jr., of Symbolics, Inc., in Palo Alto, Calif., computed 17 million digits of π. A year later David Bailey of the National Aeronautics and Space Administration Ames Research Center computed π to more than 29 million digits. More recently, Bailey and Gregory Chudnovsky of Columbia University reached one billion digits. And Yasumasa Kanada of the University of Tokyo has reported five billion digits. In case anyone wants to check this at home, the one-billionth decimal place of π, Kanada says, is nine.

FFT has also been used to find large prime numbers. Over the past decade or so, David Slowinski of Cray Research has made a veritable art of discovering record primes. Slowinski and his coworker Paul Gage uncovered the prime 21,257,787 – 1 in mid-1996. A few months later, in November, programmers Joel Armengaud of Paris and George F. Woltman of Orlando, Fla., working as part of a network project run by Woltman, found an even larger prime: 21,398,269 – 1. This number, which has over 400,000 decimal digits, is the largest known prime number as of this writing. It is, like most other record holders, a so-called Mersenne prime. These numbers take the form 2q-1, where q is an integer, and are named after the 17th century French mathematician Marin Mersenne.

For this latest discovery, Woltman optimized an algorithm called an irrational-base discrete weighted transform, the theory of which I developed in 1991 with Barry Fagin of Dartmouth College and Joshua Doenias of NeXT Software in Redwood City, Calif. This method was actually a by-product of cryptography research at NeXT.

Blaine Garst, Doug Mitchell, Avadis Tevanian, Jr., and I implemented at NeXT what is one of the strongest – if not the strongest – encryption schemes available today, based on Mersenne primes. This patented scheme, termed Fast Elliptic Encryption (FEE), uses the algebra of elliptic curves, and it is very fast. Using, for example, the newfound Armengaud-Woltman prime 21,398,269 – 1 as a basis, the FEE system could readily encrypt this issue of Scientific American into seeming gibberish. Under current number-theoretical beliefs about the difficulty of cracking FEE codes, it would require, without knowing the secret key, all the computing power on earth more than 1010,000 years to decrypt the gibberish back into a meaningful magazine.

Just as with factoring problems, proving that a large number is prime is much more complicated if the number is arbitrary – that is, if it is not of some special form, as are the Mersenne primes. For primes of certain special forms, large falls somewhere in the range of 1,000,000. But currently it takes considerable computational effort to prove that a 'random' prime having only a few thousand digits is indeed prime. For example, in 1992 it took several weeks for Francois Morian of the University of Claude Bernard, using techniques developed jointly with A.O.L. Atkin of the University of Illinois, and others, to prove by computer that a particular 1,505-digit number, termed a partition number, is prime.

USING FAST FOURIER TRANSFORMS FOR SPEEDY MULTIPLICATION

Ordinary multiplication is a long-winded process by any account, even for relatively small numbers: To multiply two numbers, *x* and *y*, each having D digits, the usual, grammars school method involves multiplying each successive digit of *x* by every digit of *y* and then adding columnwise, for a total of roughly D^2 operations. During the 1970s, mathematicians developed means for hastening multiplication of two D-digit numbers by way of the Fast Fourier Transform (FFT). The FFT reduces the number of operations down to the order of D log D. (For example, for two 1,000-digit numbers, the grammar school method may take more than 1,000,000 operations, whereas an FFT might take only 50,000 operations.)

A full discussion of the FFT algorithm for multiplication is beyond the scope of this article. In brief, the digits of two numbers, *x* and *y* (actually, the digits in some number base most convenient for the computing machinery) are thought of as signals. The FFT is applied to each signal in order to decompose the signal into its spectral components. This is done in the same way that a biologist might decompose a whale song or some other meaningful signal into frequency bands. These spectra are quickly multiplied together, frequency by frequency. Then an inverse FFT and some final manipulations are performed to yield the digits of the product of *x* and *y*.

There are various, powerful modern enhancements to this basic FFT multiplication. One such enhancement is to treat the digit signals as bipolar, meaning both positive and negative digits are allowed. Another is to weight the signals by first multiplying each one by some other special signal. These enhancements have enabled mathematicians to discover new prime numbers and prove that certain numbers are prime or composite (not prime).

[2]Выгонская Л.Н., Григорьева И.А. Английский язык для механиков и математиков. М.: МАКС Пресс, 2014; Scientific American. February, 1997, pp. 76 – 77.

2. ***Упражнения на закрепление общенаучной лексики.***

I. Fill in the gaps.

From the following list use each word only once to complete the sentences below. Remember that you may need to change the form of nouns and verbs:

Conceive (v) academic (adj) equilibrium (n) rational (adj) compute (v)
pendulum (n) series (n) section (n) stable (adj) speculate (v)

1. Reports are usually divided into separate ________ with headings such as 'Findings' and 'Conclusions'.
2. In addition to the regular lectures, we have a ________ of public lectures given by guest speakers from other universities.
3. The price of a product will not change if there is ________ between the supply and the demand for that product.
4. After a very difficult night, his blood pressure became ________ again and his family were allowed to visit him.
5. The Internet was first ________ of as a way of linking computers in the USA together.
6. Although there is very little evidence, many scientists ________ that life may exist on other planets.
7. Most economic theories assume that people act on a __________ basis, but this doesn't take account of the fact that we often use our emotions instead.
8. Students at university are encouraged to play sports or join clubs in addition to following their ____________ studies.
9. We can make machines which can _________________ huge numbers of mathematical problems, but it is still too early to claim that machines can actually think for themselves.
10. Periods of high economic growth tend to be followed by low growth, followed by higher growth again, like a ________.

II. Choose the right word.

In each of the sentences below, decide which word is more suitable.

1. A new moon *occurs/ takes* place every 28 days.
2. Most universities need to earn money from private sources, but the *important/ major* part of their funding still comes from the government.
3. The main *concentration/ focus* of the paper is on the problems concerning air pollution.
4. Although it is not very big, the library has an excellent *range/ variety* of books, journals and other resources for study.
5. It is now possible to *infer/ imply* a link between using mobile phones and contracting some forms of cancer.

III. Finish the sentences.

Choose the best ending for each of the sentence extracts below from the list underneath:

1. In 1905, Einstein published the first part of his theory…

2. Environmentalists point out that electric cars just shift …
3. Most metals expand…
4. The new grading machine has the function…
5. In some universities, there is a café adjacent…
6. After studying for three hours, it becomes difficult to concentrate…
7. In the 17th century, Galileo demonstrated…
8. Fifty years ago, most smokers were not aware…
9. The letters L, E and C on the map correspond…
10. The negotiations went on through the night, but the eventual…

a. …of the dangers of smoking.
b. … outcome was agreement on all the main points.
c. … of relativity, which completely changed our ideas of time and space.
d. … on your work, and so it's a good idea to take a break.
e. … when they are heated.
f. … of separating the larger pieces of metal from the smaller pieces.
g. … to the library where students can take a break.
h. … that all objects (heavy or light) fall at the same speed.
i. … the pollution problem from the car itself to the electricity station.
j. … to London, Edinburgh and Cardiff.

IV. Word substitution.

From the list below, choose one word which could be used in place of the words in italics without changing the meaning of the sentence. Remember that you may need to change the form or in some cases the grammatical class of the word:

Emphasize (v)   generate (v)   pertinent (adj)   undergo (v)   notion (n)

1. Lecturers often speak more loudly and more slowly when they want to *stress* an important point.
2. The new computer system *created* a lot of interest among potential customers.
3. One difficult aspect of writing an essay is selecting material which is *relevant* to the topic and excluding irrelevant information.
4. The company has *experienced* a number of significant changes in the last two years.
5. Until the 16th century, the idea that the Earth moves around the Sun was ridiculous. Today we accept this *concept* as completely normal.

V. Choose the best word.

For each of the sentences here, choose the best word from a, b or c:

1. After you have submitted your application, the university will attempt to _____________ that the information you have supplied is correct.
   a. verify b. certify c. investigate

2. In some countries, there is no tax on books on the _______________ that education should not be taxed.
   a. principle b. idea c. concept

3. Further information can be ______________ from the company's office.
   a. obtained b. found c. got

4. Good theories are important, of course, but we must have _______________ evidence to support them.
   a. empirical b. true c. realistic

5. A simple everyday example of the _______________________ is the standard postcard.
   a. triangle b. square c. rectangle

6. According to the _______________________, the building should be ready for use by the end of the year.
   a. timing b. schedule c. time

7. When you hit a drum, the movement of the drum causes the air molecules to __________________, which we hear as sound.
   a. reverberate b. vibrate c. shake

8. Although we now believe this to be impossible, early scientists tried to produce ________________ motion machines, that is, machines which would never stop.
   a. perpetual b. everlasting c. undying

9. The atmospheres of most planets are not ________________, making it difficult for us to see the surface.
   a. transparent b. lucid c. clear

10. In a nuclear power station, __________________ of uranium are split into smaller particles, releasing huge amounts of energy.
    a. atoms b. chunks c. elements

Вопросы для промежуточной аттестации (экзамена)

1. Письменный перевод на русский язык (со словарём) оригинального текста по специальности объёмом 2500-3000 печатных знаков и передача извлечённой информации на английском языке. Время на подготовку – 45-60 минут.
2. Чтение вслух и устный перевод (без словаря и без подготовки) оригинального текста по специальности объёмом 1000-1500 печатных знаков.
3. Беседа с экзаменаторами на английском языке по вопросам специальности и научной работе аспиранта.
4. Устное реферирование на английском языке оригинального текста из периодической печати (газеты, журнала).

Примеры текста на письменный перевод со словарем

1. The Generalised Dirichlet Problem

Given $f \epsilon H^0$; to find *a* $u \epsilon H_0^{m/2}$ such that (9) holds. We know that a classical solution of the Dirichlet problem is a solution of the generalised Dirichlet problem. Conversely, a solution *u* of the generalised problem which has continuous derivatives in *G* of order *m* is a classical solution of $Lu=f$; this follows from (5) by integration by parts. Moreover, if it has continuous derivatives up to order $m/2$ in *G* and *G* is sufficiently smooth, we see that all derivatives of order $\leq m/2 - 1$ vanish on *G*. Thus *u* is a classical solution of the Dirichlet problem. Thus we may solve the Dirichlet problem by first solving the generalised Dirichlet problem and then showing that the solution has the required smoothness properties.

While the problem of differentiability on the boundary is in itself very interesting, one should nevertheless remember that the generalised way of formulating boundary conditions is in many ways natural. Thus, it is well known that, even for Laplace’s equation, the Dirichlet problem may not have a classical solution, that is, a solution which is continuous up to the boundary, for the most general domain. The Hilbert space formulation of the Dirichlet problem, however, is applicable without any restrictions. In a certain sense, this formulation of the boundary condition does the thinking which would otherwise have to be performed by the mathematician posing the problem. Consider, for instance, the Dirichlet problem for the Laplace equation $\Delta u=0$ in 3 dimensions. We assume that the boundary *G* consists of smooth manifolds of dimensions 2, 1, and 0 (surfaces, curves, points).

Having once established convergence of the solution of the difference scheme under rather generous regularity assumptions on the coefficients and data, one can try to extend the convergence proof to less regular cases. It is easiest to relax the restrictions on the data. Indeed convergence must certainly hold if the data *w* and *f* are assumed to be only uniformly bounded and uniformly continuous. For then we can find sequences of data f_n, w_n converging uniformly to *f*, respectively *w*, for $n\to\infty$ and such that all derivatives of an f_n or w_n for fixed *n* are bounded uniformly. (One such approximation to *f* would be represented by the formula (5.1) with $t=1/n$.) If u_n, v_n are the solutions of differential and difference equations corresponding to f_n, w_n , we have from (6.12 6.15) that the u_n and v_n form Cauchy sequences converging respectively two functions *u, v*. There exist for every $\varepsilon>0$ an *N* such that $|u-uN|<\varepsilon$, $|v-vN|<\varepsilon$ in some given *t*-interval. Moreover, we have from (6.13) that there exists a $\delta(\varepsilon, N(\varepsilon))$ such that $|uN -vN|<\varepsilon$ for $h<\delta$.

Consequently, $|u -v|< 3\varepsilon$ for $h<\delta(\varepsilon, N(\varepsilon))$, i.e. the solution *v* of the difference scheme corresponding to *f, w* converges towards the function *u* for $h\to\infty$. Proof of convergence for discontinuous data requires more refined estimates which we shall not give here.

(from Lipman Bers, Fritz John, Martin Schechter. Partial Differential Equations. American Mathematical Society. P. 113-114)

2. Surface Wave Instability

Experiments with a thin liquid film flowing down an inclined plate under isothermal conditions have shown the development of “long” wavelength deformations on its open (referred to as “free”) surface, i.e., deformations much longer than the film thickness. “Short” waves have not been observed in experiments, at least not at smaller flow rates. These long waves seem to result from the instability of an initially uniform laminar flow. For a vertical geometry ($\beta =\pi/2$) wavy motions appear as soon as the film flows down the plate.

There are three related mechanisms influencing this *long-wave hydrodynamic instability*. One is due to the presence of gravity, more precisely its stream-wise component, which is a body force pushing the liquid to fall down to a minimum potential level. Another one is inertia, whose subtle role along with that of viscosity we shall carefully elucidate later in this monograph. The third one is the cross-stream component of gravity leading to hydrostatic pressure that tends to maintain equipotential levels and hence to prevent surface deformation. Needless to say, surface tension and, depending on the circumstances, surface tension gradients and thermal diffusivity come into play. Let us now describe three mechanisms in general physical terms.

Consider a perturbation to the flat liquid film flow in which the free surface is deflected slightly upward over a lengthscale 1 that is much longer than the depth $\hbar_N$ of the film. Because the height of the top surface varies slowly in the streamwise direction, the velocity distribution at each streamwise location will remain close to that of a fully developed viscous film flow characterized to a good first approximation by a semiparabolic profile. Indeed, by neglecting the hydrodynamic drag of the ambient gas atmosphere, the theory predicts that for low flow rates (low values of the Reynolds number), the velocity profile in the liquid film is semiparabolic. It can also be shown that the net streamwise flow rate in the film is positive and that it increases with the depth of the film. Thus, at the crests of the deflection the streamwise flow rate is at a maximum, and it is at the minimum at the troughs. The net result is that gravity draws fluid toward the front face of a crest, deflecting it upward while at the same time it draws fluid from the rear face, deflecting it downward. This first mechanism produces a wavy downstream motion of the perturbation without growth and at a phase speed higher than the velocity of any fluid particle in the undisturbed film.

Now consider at a particular instance in time a streamwise location that is at the front face of a perturbation crest. Here, the surface height is increasing because of the forward motion of the perturbation. The flow in the bulk of the film is accelerating in this position because it is attempting to follow the fully developed viscous velocity profile dictated by the surface height increase. However, inertia effects prevent the flow from accelerating fast enough to completely follow this velocity profile. The result is that the volume flux in the film is not as large as one due to a fully developed film flow. At the rear face of the crest, the velocity is decreasing, but inertia effects similarly prevent the flow from decelerating too rapidly. Thus, the volume flux in the film is larger than that due to a fully developed film flow. The net effect of the two bulk fluxes results in an accumulation of fluid underneath the perturbation crest and an increase in the interfacial displacement.

(from *Kalliadasis, S., Ruyer-Quil, C., Scheid, B., Velarde, M. Falling Liquid Films. London: Springer, 2012. P. 2-4*)

Примеры текста на чтение и перевод без словаря

1. The aim of a numerical computation scheme is to obtain a sufficiently good approximation to the solution of a problem by a finite number of steps, each of which can be carried out with sufficient accuracy by a person or a machine. Essentially the original continuous problem has to be approximated by a discrete one in a finite-dimensional space, like the problem of solving a system of linear equations in a finite number of unknowns. Among the methods used in this connection finite-difference schemes play a prominent part. Other methods such as that of Rayleigh-Ritz or expansions in orthogonal functions may be preferable in special situations and may give much more accurate results with less computation. The advantage of the use of finite differences lies in the extreme generality of the method; replacing the derivatives by difference quotients suggests itself as a natural approach in every conceivable situation involving differential equations.

From the theoretical point of view application of an approximation method is only justified if an estimate for the resulting error (or at least for the probable error) can be produced. Whether or not an error of one percent in the result is tolerable depends on the special purpose for which the result is intended. Moreover, whether or not a sequence of 10,000 rational operations of a certain kind will result in a maximum error of one percent depends on the special arrangement of the computation, the number of significant figures kept, and the type of machine used. If we want to keep error estimates free of such special accidental features, we have to permit operations involving limits and potentially an arbitrary number of steps. Such estimates will be of the form: for a given $\varepsilon>0$ there are functions $N(\varepsilon)$ and $\delta(\varepsilon)$ such that a certain scheme carried to N steps, each performed with a maximum error δ, will result in a final error of size at most ε.

(from Lipman Bers, Fritz John, Martin Schechter. Partial Differential Equations. American Mathematical Society. P. 108-109)

2. Noteworthy is that the intuitively appealing approach followed by Kapitza - that of determining the flow characteristics from a thermodynamic criterion in which energy dissipation due to viscosity is in balance with gravitational work - is naive and not sufficient in the case of a falling liquid film. Surely, the uniform laminar flow (half-Poiseuille flow) can be obtained from such a thermodynamic criterion. In general, the balance between viscous dissipation and energy supply leads to a family of steady solutions. The solution that actually occurs can then be determined by the minimization of the "viscous dissipation function" for given boundary conditions. But the uniform flow obtained from this minimization process in the case of a film on a plate is only observable for horizontal and inclined layers ($\beta\neq\pi/2$) and not when the plate is vertical ($\beta=\pi/2$). The point was the crux of the misunderstanding made by Kapitza: he thought of the wavy film dynamics as some kind of "equilibrium state" whose energy dissipation could be defined as a function of "state variables".

But a sinusoidal perturbation to the flat film is a nonequilibrium state. In fact, for vertical layers, Benjamin showed unequivocally that the previous result by Kapitsa on the instability threshold was an error, when, in view of the apparent absence of waves on very "thin films," he concluded that, for the flow down a vertical plane, there exists a critical flow rate (or a critical Reynolds number) calculated from the above thermodynamic criterion, below which the uniform laminar flow is entirely stable. Benjamin studied the stability of the uniform laminar flow for an arbitrary inclination angle $\beta \neq \pi/2$ and showed that although there is a range of low flow rates for which such base flow could be observed, this is not possible when the plate is vertical ($\beta = \pi/2$), in which case the flow is unstable for all flow rates so that a critical flow rate (or equivalently a critical Reynolds number) in the usual sense does not exist. In other words, for all finite values of the Reynolds number there is a class of sinusoidal perturbations which undergo unbounded amplification according to the linear theory.

(from *Kalliadasis, S., Ruyer-Quil, C., Scheid, B., Velarde, M. Falling Liquid Films. London: Springer, 2012. P. 5-6*)

Пример текста из периодической печати на устное реферирование

Sugaring the decision

Do not think on an empty stomach

MOST people have experienced the feeling, after a taxing mental work-out, that they cannot be bothered to make any more decisions. If they are forced to, they may do so intuitively, rather than by reasoning. Such apathy is often put down to tiredness, but a study published recently in Psychological Science suggests there may be more to it than that. Whether reason or intuition is used may depend simply on the decision-maker’s blood-sugar level—which is, itself, affected by the process of reasoning.

E.J. Masicampo and Roy Baumeister of Florida State University discovered this by doing some experiments on that most popular of laboratory animals, the impoverished undergraduate. They asked 121 psychology students who had volunteered for the experiment to watch a silent video of a woman being interviewed that had random words appearing in bold black letters every ten seconds along the perimeter of the video. This was the part of the experiment intended to be mentally taxing. Half of the students were told to focus on the woman, to try to understand what she was saying, and to ignore the words along the perimeter. The other half were given no instructions. Those that had to focus were exerting considerable self-control not to look at the random words.

When the video was over, half of each group was given a glass of lemonade with sugar in it and half was given a glass of lemonade with sugar substitute. Twelve minutes later, when the glucose from the lemonade with sugar in it had had time to enter the students’ blood, the researchers administered a decision-making task that was designed to determine if the participant was using intuition or reason to make up his mind.

The students were asked to think about where they wanted to live in the coming year and given three accommodation options that varied both in size and distance from the university campus. Two of the options were good, but in different ways: one was far from the campus, but very large; the other was close to campus, but smaller. The third option was a decoy, similar to one of the good options, but obviously not quite as good. If it was close to campus and small, it was not quite as close as the good close option and slightly smaller. If it was far from campus and large, it was slightly smaller than the good large option and slightly farther away.

A drink to decide

Psychologists have known for a long time that having a decoy option in a decision-making task draws people to choose a reasonable option that is similar to the decoy. Dr Masicampo and Dr Baumeister suspected that students who had been asked to work hard during the video and then been given a drink without any sugar in it would be more likely to rely on intuition when making this decision than those from the other three groups. And that is what happened; 64% of them were swayed by the decoy. Those who had either not had to exert mental energy during the showing of the video or had been given glucose in their lemonade, used reason in their decision-making task and were less likely to be swayed by the decoy.

It is not clear why intuition is independent of glucose. It could be that humans inherited a default nervous system from other mammals that was similar to intuition, and that could make snap decisions about whether to fight or flee regardless of how much glucose was in the body.

Whatever the reason, the upshot seems to be that thinking is, indeed, hard work. And important decisions should not be made on an empty stomach.

(The Economist, March 2008)

Методические материалы для проведения процедур оценивания результатов обучения

Экзамен проводится по билетам, включающим три вопроса. Уровень знаний аспиранта оценивается по каждому вопросу на «отлично», «хорошо», «удовлетворительно», «неудовлетворительно». В случае если на все вопросы был дан ответ, оцененный не ниже, чем «удовлетворительно», аспирант получает общую положительную оценку.

Шкала оценивания знаний, умений и навыков

РЕЗУЛЬТАТ ОБУЧЕНИЯ по дисциплине (модулю)	**КРИТЕРИИ ОЦЕНИВАНИЯ РЕЗУЛЬТАТА ОБУЧЕНИЯ по дисциплине (модулю) и ШКАЛА оценивания**					**ПРОЦЕДУРЫ ОЦЕНИВАНИЯ***
	1	2	3	4	5	
З1 (УК-4)	Отсутствие знаний	Фрагментарные знания методов и технологий научной коммуникации на государственном и	Неполные знания методов и технологий научной коммуникации на государственном и	Сформированные, но содержащие отдельные пробелы знания методов и технологий научной коммуникации	Сформированные и систематические знания методов и технологий научной коммуникации на	Тестирование Экзамен

		иностранном языках	иностранном языках	на государственном и иностранном языках	государственном и иностранном языках	
З2 (УК-4)	Отсутствие знаний	Фрагментарные знания стилистических особенностей представления результатов научной деятельности в устной и письменной форме на государственном и иностранном языках	Неполные знания стилистических особенностей представления результатов научной деятельности в устной и письменной форме на государственном и иностранном языках	Сформированные, но содержащие отдельные пробелы знания основных стилистических особенностей представления результатов научной деятельности в устной и письменной форме на государственном и иностранном языках	Сформированные систематические знания стилистических особенностей представления результатов научной деятельности в устной и письменной форме на государственном и иностранном языках	Тестирование Экзамен
У1 (УК-4)	Отсутствие умений	Частично освоенное умение следовать основным нормам, принятым в научном общении на государственном и иностранном языках	В целом успешное, но не систематическое умение следовать основным нормам, принятым в научном общении на государственном и иностранном языках	В целом успешное, но содержащее отдельные пробелы умение следовать основным нормам, принятым в научном общении на государственном и иностранном языках	Успешное и систематическое умение следовать основным нормам, принятым в научном общении на государственном и иностранном языках	Тестирование Экзамен
В1 (УК-4)	Отсутствие навыков	Фрагментарное применение навыков анализа научных текстов на государственном и иностранном языках	В целом успешное, но не систематическое применение навыков анализа научных текстов на государственном и иностранном языках	В целом успешное, но сопровождающееся отдельными ошибками применение навыков анализа научных текстов на государственном и иностранном языках	Успешное и систематическое применение навыков анализа научных текстов на государственном и иностранном языках	Тестирование Экзамен
В2 (УК-4)	Отсутствие навыков	Фрагментарное применение навыков критической оценки эффективности различных методов и технологий научной коммуникации на государственном и иностранном языках	В целом успешное, но не систематическое применение навыков критической оценки эффективности различных методов и технологий научной коммуникации на государственном и	В целом успешное, но сопровождающееся отдельными ошибками применение навыков критической оценки эффективности различных методов и технологий научной коммуникации на	Успешное и систематическое применение навыков критической оценки эффективности различных методов и технологий научной коммуникации на государственном и	Тестирование Экзамен

			иностранном языках	государственном и иностранном языках	иностранном языках	
В3 (УК-4)	Отсутствие навыков	Фрагментарное применение различных методов, технологий и типов коммуникаций при осуществлении профессиональной деятельности на государственном и иностранном языках	В целом успешное, но не систематическое применение различных методов, технологий и типов коммуникаций при осуществлении профессиональной деятельности на государственном и иностранном языках	В целом успешное, но сопровождающееся отдельными ошибками применение различных методов, технологий и типов коммуникаций при осуществлении профессиональной деятельности на государственном и иностранном языках	Успешное и систематическое применение различных методов, технологий и типов коммуникаций при осуществлении профессиональной деятельности на государственном и иностранном языках	Тестирование Экзамен

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