Министерство образования и науки Российской Федерации
Федеральное государственное бюджетное образовательное учреждение
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«Кузбасский государственный технический университет имени Т. Ф. Горбачева»

Кафедра иностранных языков

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Учебное пособие для самостоятельной работы студентов заочной формы обучения всех направлений подготовки

Электронное учебное пособие

Кемерово 2016

Вперед→

УДК 378.147

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Приведен грамматический и лексический материал, необходимый при подготовке к зачету и экзамену. Организация материала точно соответствует последовательности подачи заданий в контрольных работах. В приложении даны тексты для развития навыков чтения и перевода по общенаучным темам и профилям подготовки.

Пособие разработано для студентов заочной формы обучения всех направлений с разным уровнем владения английским языком.

Текстовое (символьное) электронное издание

Минимальные системные требования:	Частота процессора не менее 1,0 ГГц; ОЗУ 512 Мб; 20 Гб HDD; операционная система Windows XP; CD-ROM 4-скоростной; ПО для чтения файлов PDF-формата; SVGA-совместимая видеокарта; мышь.

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Сведения о программном обеспечении, которое использовано для создания электронного издания	MS Word
Сведения о технической подготовке материалов для электронного издания	Редактор З. М. Савина
Объем издания в единицах измерения объема носителя, занятого цифровой информацией (байт, Кб, Мб)	1,0 мегабайт
Продолжительность звуковых и видеофрагментов (в минутах)	–
Комплектация издания (количество носителей, наличие сопроводительной документации)	1 CD-диск, без сопроводительной документации
Наименование и контактные данные юридического лица, осуществившего запись на материальный носитель	Федеральное государственное бюджетное образовательное учреждение высшего образования «Кузбасский государственный технический университет имени Т. Ф. Горбачева» 650000, Кемерово, ул. Весенняя, 28 Тел./факс: 8(3842) 58-35-84 Email: prorector@kuzstu.ru

Вперед→

Оглавление

Предисловие

Настоящие пособие разработано с учетом требований Федерального Государственного образовательного стандарта высшего образования и предназначены для студентов, обучающихся на заочном отделении.

Целью данного пособия является организация самостоятельной работы студентов заочной формы обучения, направленной на формирование у них такой общекультурной компетенции, формирование у студентов такой общекультурной компетенции, как способность осуществлять социальное взаимодействие на одном из иностранных языков.

Упражнения и задания, представленные в контрольных работах, направлены на обеспечение практического владения студентами английским языком на уровне умения самостоятельного чтения и понимания общенаучной и общетехнической (по профилю вуза) литературы.

Сопутствующая задача – обеспечить корректировку и выравнивание уровня знаний, умений и навыков студентов заочного отделения, приступающих к изучению иностранного языка в вузе.

Проработка практических материалов данных указаний обеспечивает необходимую и достаточную базу для перехода к работе с текстами по широким вопросам будущей профессиональной деятельности студентов.

Пособие включает указания и рекомендации по подготовке к зачету / экзамену по дисциплине “Иностранный язык” (английский); контрольные работы и необходимый для их выполнения языковой материал, а также тексты для самостоятельного чтения и перевода.

I. Указания и рекомендации по подготовке к зачету / экзамену

1. Требования для получения допуска к зачету

Для получения допуска к зачету по английскому языку студенту заочного отделения требуется:

1. выполнить и защитить контрольные работы, в соответствии с учебным планом;
2. подготовить чтение и перевод 2 общетехнических / общенаучных текстов;
3. подготовить высказывание по темам семестра

2. Правила оформления контрольных работ

1. Работы выполняются в печатном виде и представляются в дирекцию или непосредственно преподавателю, предварительно зарегистрировав работу в дирекции, **за месяц до начала сессии**. На титульном листе должны быть четко представлены следующие данные: **название языка** (английский); **номер и вариант контрольной работы**; **фамилия, имя, отчество (студента)**; **группа и шифр**.

Образец титульного листа расположен на странице 6.

Страницы текста и приложений должны соответствовать формату А4 (210×297). Выполнение работы осуществляется машинописным способом на одной стороне листа белой бумаги через 1,5 интервал, шрифт 14, New Times Roman. Текст следует печатать, соблюдая следующие размеры полей: левое – не менее 30 мм, правое – не менее 10 мм, верхнее – не менее 15 мм, нижнее – не менее 20 мм.

2. Работы с пометой рецензента “К защите” остаются на кафедре и дорабатываются студентом во время сессионных занятий под руководством преподавателя.

3. Работы с пометой “Незачет” возвращаются студенту на переработку. Работа, выполненная без соблюдения предъявляемых требований, возвращается без проверки.

4. Отрецензированные и исправленные контрольные работы хранятся на кафедре иностранных языков до сдачи студентом зачета / экзамена.

3. Подготовка текстовых материалов

1. Текстовые материалы построены на общенаучной и общетехнической лексике и являются переходным звеном к чтению текстов по направлению подготовки.

Тексты для самостоятельной работы прорабатываются студентом заранее и сдаются в устной форме на сессионных занятиях. При работе над текстом необходимо составить список неизвестных слов, которым можно пользоваться при ответе.

2. Для получения зачета по тексту необходимо показать следующие умения: а) чтение отрывка текста на языке; б) перевод текста с правильной передачей на русский язык грамматических явлений, вошедших в материал контрольных работ; с) умение высказаться по темам семестра (10-15 предложений).

4. Требования, предъявляемые к студенту на зачете:

1. Умение читать и переводить общетехнические и общенаучные тексты.
2. Умение высказываться по темам по темам семестра.

5. Требования, предъявляемые к студенту на экзамене

1. Умение переводить тексты профессиональной направленности.
2. Умение аннотировать тексты по специальности.
3 Умение высказываться по темам по темам семестра.

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имени Т. Ф. Горбачева»

Контрольная работа №…..

по дисциплине «Иностранный язык (английский)»

Выполнил(а) студент(ка) гр.____

Ф.И.О.____________________

Оценка_______

Дата проверки_________

Преподаватель ________

Кемерово 20__

КОНТРОЛЬНАЯ РАБОТА №1

Задание 1. *Изучите грамматический материал ниже*

Время **Present Simple** обозначает действие в настоящем в широком смысле слова. Оно употребляется для обозначения:

1. обычных, регулярно повторяющихся или постоянных действий, например, когда мы говорим о чьих-либо привычках, режиме дня, расписании и т. д.;

Например: He always **goes** to work by car. − Он всегда ездит на работу на машине.

We never **finish** work before 8 o’clock. − Мы никогда не заканчиваем работу раньше 8 часов.

2. общеизвестных фактов, законов природы, научных и общепринятых утверждений;

Например: The sun **rises** in the east. − Солнце восходит на востоке.

Water **boils** at 100˚C. − Вода кипит при температуре 100˚C.

3. состояния человека или предмета, передать эмоции;

4. последовательных действий

Например: We **analyze** data, **develop** a new product, **produce** a sample, **improve** it and **sell** it. − Мы анализируем данные, разрабатываем новый продукт, производим образец, вносим необходимые улучшения и продаем его.

1. Чтобы образовать утверждение в **Present Simple**, мы берем глагол и ставим его на второе место в предложение, после подлежащего. С местоимениями **he, she, it** и существительными в единственном числе (an engineer – инженер, a student – студент) к глаголу добавляется окончание **-s** (**-es** после **s, sh, ch, x, o**). Например: I **work** – He **works, We go –** She **goes**. Глаголы,

оканчивающиеся на **согласный + y** в 3-м лице единственного числа меняют **-y** на **-i-** + **-es**. Например: study − исследовать, изучать; studies − исследует, изучает. Если перед **-y** стоит **гласный**, действует общее правило: employ нанимать; employs − нанимает. Глагол **have** в 3ем лице единственном числе имеет форму **has.**

В вопросительных и отрицательных предложениях используется вспомогательный глагол **do** (для **he / she / it** в 3-м лице единственного числа − **does**). В отрицательных предложениях после него ставится отрицание **not** (краткие формы: do not = don't, does not = doesn't). В вопросительных предложениях вспомогательный глагол ставится перед подлежащим. Основной глагол берется в форме инфинитива.

Например: We **don’t produce** equipment. − Мы не производим оборудование.

She **doesn’t deal** with clients. − Она не работает с клиентами.

Do the employees **change** their passwords regularly? − Сотрудники регулярно меняют свои пароли?

Does your plant **refine** coal? − Ваша фабрика обогащает уголь?

2. Глагол **be** − быть имеет в настоящем времени три формы I **am**, he / she / it **is**, you / we / they **are**

В отрицательных предложениях после соответствующей формы глагола **be** ставится отрицание not − **is not = isn't, are not = aren't.**

Например: Crude oil **is** the basic raw material for the plastics industry. −Сырая нефть − основное сырье в производстве пластмасс.

The fault **isn’t** very serious. − Поломка не очень серьезная.

Is it the best possible level of production? − Это лучший уровень качества продукции, который возможен?

3. Страдательный залог в **Present Simple** образуется с помощью вспомогательного глагола to be в формах am, is, are и Participle II смыслового глагола (**третья форма** неправильного глагола, **правильный глагол + ed**).

Например: Investigations **are carried** out at our plant laboratory. − Исследования проводятся в нашей заводской лаборатории.

Задание 2. *Образуйте формы 3его лица единственного числа в Present Simple от данных глаголов*

1. I swim – she **swims**
2. we go − he
3. they finish −
4. you produce −
5. we change −
6. they display −
7. we explore −
8. you have −
9. I fly −
10. they teach −

Задание 3. *Поставьте глаголы в скобках в Present Simple*

1. The text ______ (describe) basic steps to drill a surface hole.
2. The vapours of the different components ______ (condense) on collectors at different heights.
3. Refining process ______ (involve) removing the impurities.
4. Building cars ______ (take) a long time from research to final development.
5. Engineers ______ (modify) existing parts and features for the new model.
6. Marketing team ______ (promote) final products.
7. We ______(taste) our products in different conditions.
8. Researchers ______ (analyze) the answers and suggest the way to solve the problem.
9. The chemical industry ______ (cover) the business that ______ (use) chemical reaction to turn raw materials into different products.
10. Electrical engineering ______ (deal) with the practical application of the theory of electricity.
11. Civil engineering ______ (cover) different areas such as design and construction of roads, buildings, canals, airports, water-supply systems and so on.
12. Information systems ______ (collect), ______ (organize), ______ (store), ______ (process), ______ (retrieve) and ______ (display) information in different formats (text. video, and voice).

13. Logistics ______ (describe) the organized movement of physical materials in a factory.
14. Vapour from the liquid ______ (escape) into the air.

Задание 4. *Сделайте предложения из упражнения 2 отрицательными.*

Образец: The text **describes** basic steps to drill a surface hole. – The text **doesn't describe** basic steps to drill a surface hole.

Задание 5. *Переведите предложения из действительного залога в страдательный. Выделенное слово (слова) должно(ы) стать подлежащим*

Образец: They *form* **crystals** from the precipitation process. – **Crystals** *are formed* from the precipitation process.

1. People pollute the **environment**.
2. Employees change their **passwords** regularly
3. People in this area take **waste plastic** to recycling centres.
4. We try **a curbside collection system**.
5. They use **imported raw materials**.
6. These measures solve **urgent problems**.
7. Our researchers develop **fibre optics**.
8. They prepare **access to this mine.**
9. I usually upload new web pages.
10. We digitize **the pictures** so that we can upload them to our website.

Задание 6. *Составьте рассказ о своем рабочем дне (10 – 15 предложений). Используйте вопросы ниже в качестве плана*

1. How old are you?
2. Where are you from?
3. Where do you work?
4. What's your job?

5. When do you get up at week days?
6. What do you do after you get up?
7. What do you usually have for breakfast?
8. When do you live home?
9. How do you go to work?
10. How long does it take you to get to work?
11. When does your working day start?
12. What do you do during your working day?
13. Where do you have lunch?
14. When do you finish work?
15. Do you work at weekends?
16. When do you come home after work?
17. What do you do in the evenings?
18. When do you go to bed?

Задание 7. *Изучите грамматический материал ниже*

Время **Past Simple** используется для обозначения действия, которое произошло в определенное время в прошлом и время совершения которого уже истекло.

Для уточнения момента совершения действия в прошлом при использовании времени Past Simple обычно используются такие слова, как five days **ago** − пять дней назад, **last** week / month / year − на прошлой неделе / в прошлом месяце / году, **yesterday** − вчера, **in** 1980 − в 1980 году и т.д.

В утвердительных предложениях к правильным глаголам добавляем окончание ***-ed***.

НО: Если глагол заканчивается на **e**, то добавляется только **d.**

Например: investigate – investigate**d**, examine – examined, play – play**ed**

Обратите внимание: y заменяем **на i** после согласных, удваиваем конечный согласный, если на конце согласный и краткий ударный гласный или буква **L. Но**: В американском варианте английского языка **L** не удваивается).

Например: study **–** stud**ied,** stop **–** stop**ped,** travel **–** travel**led**

Для неправильных глаголов, которые образуют форму прошедшего времени не по общим правилам, берем вторую форму из таблицы (она так и называется **Past Simple**). Эти формы нужно просто запомнить.

Например: do **– did,** go **– went,** speak **– spoke,** begin **– began**

В отрицательных и вопросительных предложениях необходим вспомогательный глагол **did.** В отрицательных предложениях он ставиться перед сказуемым и к нему добавляется частица **not**, глагол-сказуемое берется в форме инфинитива (начальной, 1 формы глагола).

Например: We **went** fishing. – We **didn't go** fishing.

They **started** the construction of a new school. – They **didn't start** the construction of a new school.

В вопросительных предложениях **did** ставиться перед подлежащим, глагол-сказуемое также берется в форме инфинитива.

Например: When **did** he **graduate** from the university? ‒ Did you pass your test yesterday? ‒ What **did** the company **begin**?

Глагол **be** имеет в **Past Simple** две формы **was** ‒ для единственного числа и **were** ‒ для множественного числа. Он сам строит вопросительные и отрицательные предложения.

Например: I **was** at home at 6 o'clock yesterday. – I **wasn't** at home at 6 o'clock yesterday. – **Was** I at home at 6 o'clock yesterday?

We **were** very tired. – We **weren't** very tired. – **Were** we very tired?

Страдательный залог в **Past Simple** образуется с помощью вспомогательного глагола **be** в формах **was, were** и **Past participle** смыслового глагола (**третья форма** неправильного глагола, **правильный глагол + ed**).

Например: The house **was built** 2 years ago. ⁻ Дом был построен 2 года назад.

The researches **were carried** out in this laboratory. ⁻ Исследования были проведены в нашей лаборатории.

Задание 8. *Образуйте формы Past Simple от данных глаголов*

go –	finish –
study –	understand –
begin –	drop –
sit –	read –
forget –	start –
regret –	credit –

Задание 9. *Поставьте глаголы в скобках в Past Simple*

1. The goods ______ (be) in transit four days.
2. He immediately ______ (phone) to his office to report the loss.
3. Someone ______ (make) repeated multiple incorrect password attempts.
4. The administrator ______ (see) a security alert on a computer screen.
5. The police ______ (complete) the investigation into a loss of encrypted data.
6. The maintenance team ______ (repair) the fault in the jet engine.
7. The carton ______ (pass) through the scanning portal.
8. That system ______ (keep) an eye on security issues.
9. The major building companies ______ (ask) the government about subsidiaries.
10. A sensor ______ (detect) a change in surroundings and ______ (convert) it into a signal which ______ (be) read by an observer.

Задание 10. *Сделайте предложения из задания 9 отрицательными*

Образец: The police **completed** the investigation into a loss of encrypted data. − The police **didn't complete** the investigation into a loss of encrypted data.

Задание 11. *Переведите предложения из действительного залога в страдательный. Выделенное слово (слова) должно(ы) стать подлежащим*

Образец: They built t**he house** 2 years ago. – **The house** was built 2 years ago.

1. They cancelled **a contract**.
2. The company gave a **discount**.
3. They missed the deadline.
4. They recommended **some improvements**.
5. They pump **sea water** on the green house roof.
6. The government announced **an award of €65mln to the company researching the most promising micro nano scale technology**.
7. We normally produced **research studies and preliminary analysis**.
8. They made **ancient paper** entirely of rags; we made **modern paper** from wood pulp − a faster and cheaper alternative.
9. We designed **the longest bridge** in the world.
10. Somebody dented **the speakers**.
11. They cracked **the cover of the plug**.
12. Someone tore **the manual**.
13. The Russians launched **Sputnik** on the 5^{th} October 1957.
14. The Europeans launched **Galileo**, a global navigation satellite.
15. A virus attacked **our office computers** two hours ago.

Задание 12. *Составьте рассказ о себе (10 – 15) предложений. Используйте вопросы ниже в качестве плана*

1. When and where were you born?

2. How old were your parents when you were born?
3. What school did you study at?
4. What subjects were you good at?
5. What subjects were you bad at?
6. What were you interested in when you were young?
7. What food did you like when you were young?
8. What did you enjoy doing in your free time?
9. What music did you listen to?
10. How did you spend your holidays?
11. What films did you watch?
12. Did you have a happy childhood?

Задание 13. *Изучите грамматический материал ниже*

Степени сравнения прилагательных и наречий. Качественные имена прилагательные и наречия образа действия в английском языке, так же как и в русском, имеют три степени сравнения: положительную, сравнительную и превосходную. Односложные прилагательные и наречия, а также двусложные, оканчивающиеся на **-y, -e, -er, -ow**, образуют сравнительную степень путем прибавления к положительной степени суффикса **-er**, а превосходную степень − с помощью суффикса **-est**.

Например: small *маленький* – small**er** меньше – **the** small**est** *самый маленький*

Если прилагательное или наречие оканчивается на **-y** с предшествующей согласной буквой, то при образовании сравнительной и превосходной степени **-y** меняется на **-i-**

Например: pretty *симпатичный* – pretti**er** *симпатичнее* – **the** pretti**est** *самый симпатичный*

Если прилагательное или наречие оканчивается на согласную букву с предшествующим кратким ударным звуком, то конечная согласная буква удваивается

Например: большой big – bi**gg**er *больше*– the bi**gg**est *самый большой*

Многосложные прилагательные и наречия, а также большинство двусложных прилагательных (кроме оканчивающихся на **-y, -e, -er, -ow**) образуют сравнительную степень при помощи слова **more** *более*, а превосходную степень – при помощи слова **most** *самый*, наиболее, которые ставятся перед прилагательным или наречием в форме положительной степени.

Например: interesting *интересный* – **more** interesting *интереснее* – **the most** interesting *самый интересный*

Кроме того, существует ряд прилагательных и наречий, которые образуют степени сравнения от других корней.

Например: **good (well)** *хороший, хорошо* – **better** *лучше*– **the best** *самый лучший*

bad (badly) *плохой, плохо* – **worse** *хуже* – **the worst** *самый плохой*

little *маленький* – **less** *меньше* – **the least** *самый маленький*

many (much) *много* – **more** *больше* – **the most** *самый большой*

far *далекий, далеко* – **farther / further** *дальше* – **the farthest / the furthest** *самый далекий*

Задание 14. *Образуйте степени сравнения следующих прилагательных и наречий и переведите их*

hot –
small –
attractive –
busy –
stable –
beautiful –
shallow –
safe –
dangerous –
intelligent –

Задание 15. *Поставьте прилагательные / наречия в скобках в необходимую по смыслу форму. Переведите предложения*

1. The technology has a very ______ (big) environmental benefit, because snake wells mean that you can build ______ (few) oil platforms and do ______ (little) drilling.
2. This enables continuous monitoring of production, and engineers can make ______ (speedy) decisions on how ______ (good) to extract the maximum amount of oil.
3. Champion West has been changed into one of the world's ______ (advanced) oil and gas fields by means of Smart Fields technology and ______ (new) drilling techniques.
4. This ______ (new) type of smoke detector is ______ (sensitive) than our ______ (old) model.
5. A bipolar transistor is ______ (common) form of transistor.
6. A bit is ______ (small) unit of binary data.
7. Sending the goods by air is certainly ______ (quick) but it's also ______ (expensive).
8. Pollution of the ground is ______ (serious) in area A than in area B.
9. Please wear ear protection because it's ______ (noisy) here than in the other areas.
10. That was ______ (loud) explosion I've ever heard.
11. This data are ______ (reliable) of all.
12. We finished the project ______ (fast) than expected.
13. Improved quality control has led to ______ (high) efficiency in production.

Задание 16. *Ответьте на вопросы*

1. What is the most interesting film you've seen?
2. What is the worst food you've ever eaten?
3. Which is more difficult for you English or mathematics?
4. Where was your best holiday?
5. Who is the oldest in your family?
6. Who is the youngest in your family?
7. What is the best day of your life? Why?
8. What subject takes you more time to get ready?

9. What subject is the most interesting for you?
10. What subject is the least interesting for you?

Задание 17. *Изучите грамматический материал ниже*

Времена группы **Continuous** указывают на процесс, действие, длящееся в определенный момент в прошлом, настоящем или будущем. Образуются при помощи вспомогательного глагола **be** (в настоящем, прошедшем или будущем времени)**+ основной глагол с окончанием -ing.**

При присоединении окончания **-ing** к глаголам происходят следующие изменения:

1. непроизносимая **-е**, на которую оканчивается глагол, выпадает: **take** – **taking**, **make** – **making;**

2. если односложный глагол оканчивается на одну согласную после краткого слога, согласная удваивается: **stop** – **stopping**, **drop** – **dropping;**

3. если многосложный инфинитив оканчивается на одну согласную после ударного слога, эта согласная удваивается: **occur** – **occurring**, **forget** – **forgetting:**

4. если инфинитив оканчивается на **-l**, она удваивается независимо от ударности / безударности слога (в американском варианте английского языка удвоения не происходит): **travel** – **travelling**, **expel** – **expelling**

5. конечная – у не претерпевает никаких изменений: **stay** – **staying**, **carry** – **carrying**

6. в глаголах, оканчивающихся на **-ie**, -ie меняется на **-y**: **lie** – **lying, die** – **dying.**

Present Continuous указывает на процесс, происходящий непосредственно в момент речи. На это могут указывать контекст или такие слова, как **now** *сейчас*, **at the moment** *в данный момент* и т.п., описывает свойства характера человека с негативной окраской (He is always complaining. − *Он постоянно жалуется.*), обозначает личные планы, действия, запланированные в будущем (Next week I’m flying to Moscow on business. − На следующей неделе я улетаю в командировку в Москву.)

Present Continuous образуется:

1. утвердительные предложения: **am / is /are + глагол с окончанием ing**

Например: **I am checking** the delivery. – *Я сейчас проверяю доставленную партию товара.*

The manager (**he / she / it**) **is checking** the delivery. – *Менеджер сейчас проверяет доставленную партию товара*.

We /you / they are checking the delivery. – *Мы сейчас проверяем / вы сейчас проверяете / ты сейчас проверяешь/ они* сейчас *проверяют доставленную партию товара*.

2. отрицательные предложения: **am not / is not /are not + глагол с окончанием -ing**

Например: **I am not checking** the delivery. – *Я сейчас не проверяю доставленную партию товара.*

The manager (**he / she / it**) **is not checking** the delivery. – *Менеджер сейчас не проверяет доставленную партию товара*.

We /you / they are not checking the delivery. – *Мы сейчас не проверяем / вы сейчас не проверяете / ты сейчас не проверяешь/ они* сейчас не *проверяют доставленную партию товара*.

3. вопросительные предложения: **Am / Is / Are + подлежащее + глагол с окончанием -ing**

Например: **Am I checking** the delivery?
Are we /you / they checking the delivery?
Is he / she / it checking the delivery?

Past Continuous указывает на процесс, длившийся в определенный момент или период в прошлом, образуется:

1. утвердительные предложения:**was / were + глагол с окончанием -ing**

Например: **I / he / she / it was checking** the delivery at 4 o'clock. – *Я проверял / он проверял / она проверяла / оно проверяло доставленную партию товара в 4 часа.*

We / you / they were checking the delivery. – *Мы проверяли / вы проверяли / ты проверял / они проверяли доставленную партию товара в 4 часа.*

2. отрицательные предложения: **was not / were not + глагол с окончанием -ing**

Например: **I / he / she / it was not checking** the delivery at 4 o'clock. – *Я не проверял / он не проверял / она не проверяла / оно не проверяло доставленную партию товара в 4 часа.*

We / you / they were not checking the delivery. – *Мы не проверяли / вы не проверяли / ты не проверял / они* не *проверяли доставленную партию товара в 4 часа.*

3. вопросительные предложения: **Was / Were + подлежащее + глагол с окончанием -ing.**

Например: **Was I / he / she / it checking** the delivery at 4 o'clock?
Were we / you / they checking the delivery?

Задание 18. *Ответьте на вопросы, используя Present Continuous / Past Continuous*

1. What were you doing at 12 o'clock on 31st of December?
2. What were you wearing?
3. What were your family doing?
4. Was the TV working?
5. What were you feeling at that moment?
6. What are you doing now?
7. What are you wearing?
8. Where are you sitting?
9. What time of a day are you doing this test?
10. What dictionary are you using?

Задание 19. *Выберите из [приложения] текст, соответствующий профилю подготовки, и письменно переведите его*

Задание 20*. Напишите рассказ о себе и своей семье (10 – 15 предложений) и запомните его*

КОНТРОЛЬНАЯ РАБОТА № 2

Задание 1. *Изучите грамматический материал ниже*

Множественное число имен существительных в английском языке образуется путем прибавления окончания **-s, -es** после **s, sh, ch, o.** Если существительное в единственном числе оканчивается на **согласную + y**, то **y** заменяется на **i**, и добавляется окончание **-es.** Если существительное в единственном числе оканчивается на гласную, после которой следует у, то добавляется окончание **-s.**

Существительные, оканчивающиеся на **-f** или **-fe**, образуют множественное число с заменой **f** на **v**, и прибавлением окончания **-es.**

Например: **wire** *провод, проволока* – **wires, switch** *переключатель* – **switches, box** *коробка* − **boxes, study** *исследование, обучение* − **studies, play** *пьеса* − **plays, life** *жизнь* − **lives**

В составных существительных множественную форму принимает главное слово. Если же в составном существительном ни одно из слов, входящих в его состав, не является существительным, окончание множественного числа прибавляется к последнему слову.

Например: **passer-by** *прохожий* – **passers-by, grown-up** *взрослый* – **grown-ups, forget-me-not** *незабудка* − **forget-me-nots, looker-on** *зритель, наблюдатель* − **lookers-on**

Так же следует запомнить ряд существительных, у которых множественное число образуется за счет изменения формы слова.

Например: **foot** *ступня* − **feet, tooth** *зуб* − **teeth, man** *мужчина, человек* − **men, woman** *женщина* − **women, mouse** *мышь* − **mice, goose** *гусь* − **geese, child** *ребенок* − **children, datum** *информация, данные* − **data, analysis** *анализ, исследование* − **analyses**

Задание 2. *Образуйте формы множественного числа, выделенных существительных, сделайте все необходимые изменения в предложениях*

1. The present **machinery** is old and a **breakdown** recently has caused a production **backlog**.
2. An investment decision **method** focuses on an alternative **method** for financing the investment needed.
3. The process **material** is tested using a highly developed analyses **technique**.
4. Charles Dyson is the inventor of a **vacuum cleaner** which works on a new **principle**.
5. A **report** was prepared on a **test** that had been carried out.
6. This **method** of production is still at an experimental **stage**.
7. A **test** is carried out on a **volunteer**.
8. A **decision** is made by the committee and a **license** issued before the new **product** is introduced.

Задание 3. *Изучите грамматический материал ниже*

Present Perfect образуется при помощи вспомогательного глагола для **I / we / you / they - have** и **has** для **he /she / it** и **Past participle** смыслового глагола (**третья форма** неправильного глагола, **правильный глагол + ed**).

Например: She **has just finished** her investigation. − *Она только что закончила свои исследования.*

Engineers **have already developed** a new type of engine. − *Инженеры уже разработали новый тип двигателя.*

В отрицательных предложениях частица **not** ставится после **have / has.**

Например: She **hasn't finished** her investigation. − *Она еще не закончила свои исследования.*

Engineers **haven't developed** a new type of engine. − *Инженеры еще не разработали новый тип двигателя.*

Чтобы сделать предложение вопросительным, необходимо поставить have / has перед подлежащим.

Например: **Has** she just finished her investigation? ‒ *Она уже закончила свои исследования?*

Have engineers already developed a new type of engine? ‒ *Инженеры уже разработали новый тип двигателя?*

Present Perfect употребляется для выражения:

1. действия, завершившегося к моменту речи. Время действия не указывается, важен сам факт совершения действия к настоящему моменту или его результат.

Например: She has read this book. ‒ *Она прочитала эту книгу.* (Действие завершено к моменту речи.)

В этом значении **Present Perfect** часто употребляется с наречиями **just** *только что*, **already** *уже*, **yet** *ещё*, **lately** *недавно*, **of late** *в последнее время*, **recently** *недавно*.

Например: The mail has **just** come. ‒ *Почта только что пришла.*

He has seen a lot of films **lately**. ‒ *В последнее время он посмотрел много фильмов.*

2. Для выражения действия, которое завершилось, но тот период, в котором оно происходило, ещё продолжается и может быть обозначен обстоятельствами времени **today** *сегодня*, **this week** *на этой неделе*, **this month** *в этом месяце*, **this year** *в этом году* и др.

Например: I have written a letter **this** morning. ‒ *Я написал(а) письмо сегодня утром. (утро еще не закончилось)*

Страдательный залог в **Present Perfect** образуется **have / has + been** + **Past participle** смыслового глагола (**третья форма** неправильного глагола, **правильный глагол + ed**

Например: The letter **has been written** this morning. – *Письмо было написано сегодня утром.*

The new products **have already been produced**. – *Новые изделия уже выпущены.*

Задание 4. *Поставьте глаголы в скобках в Present Perfect*

1. Archimedes stepped into his bath and shouted ‘Eureka!’ – ‘I ______ (discover) it!’
2. Improved quality control ______ (lead) to higher efficiency in production.
3. Recent faults with equipment ______ (cost) the company a great deal of slack tie.
4. The scientists ______ (present) a detailed results of the analyses.
5. The researchers ______ (develop) innovative idea of recycling wastes.
6. The speed of processing data ______ (significantly increase).
7. We ______ (renew) our company’s page.
8. The motor company ______ (announced) that they are recalling all their cars produced in February.
9. Our security department ______ (gather) all necessary information about our potential partner.
10. Our contractor ______ (build) a supporting wall.
11. The newly designed model ______ (already come off) the production line.
12. They ______ (introduce) completely new airbags.
13. Our engineers ______ (analyze) the results of the carried out tests.
14. A new open-pit mine ______ (start) operating this week.
15. Over the last twenty years, the average size of households ______ (fall) dramatically.

Задание 5. *Сделайте предложения из задания 4 отрицательными*

Задание 6. *Ответьте на вопросы*

1. Have you ever changed your job? If yes, when exactly?
2. What films have you recently seen?
3. What cities have you visited this year? Why did you go there?
4. Have you ever been abroad? If yes, what countries have you visited? If no, what countries do you want to visit?
5. Have you ever taken part in competitions / contests? If yes, in what competitions / contests? If no, would you like to take part in any?
6. Have you ever gone away on business? If yes, where did you go?
7. What is the best place you have ever been? Why did you like it?
8. What is the most unusual food you have ever tried? What was it like?
9. What is the best holiday you have ever had? When and where was it?
10. What is the most difficult task you have ever fulfilled?

Задание 7. *Изучите грамматический материал ниже*

Модальные глаголы отличаются от остальных глаголов тем, что они не используются самостоятельно и не обозначают конкретного действия или состояния, они отражают его модальность, то есть отношение к нему говорящего. Например, оценивать действие как возможное, необходимое, разрешаемое, просимое, запрещенное, приказываемое, маловероятное. Вместе модальный глагол и инфинитив значащего глагола образуют составное модальное сказуемое.

Например: It **must** be a great fun. – *Должно быть, это очень весело.*

I **can't** really believe it. – *Я, действительно, не могу поверить.*

You **should** see a doctor. – *Вам следует обратиться к врачу.*

Наиболее часто употребляются следующие модальные глаголы и их синонимы **can** (be able) *мочь, уметь*; **must** (**have to** *должен, вынужден из-за обстоятельств*) *должен*; **may** *возможно, вероятно;* **should** *следует*, **need** *нужно, необходимо*, **allow** *разрешать, позволять* **(be allowed to).**

Задание 8. *Дополните предложения, используя подходящие по смыслу модальные глаголы. Некоторые могут быть использованы несколько раз*

must allow need(n't) can(not) could should may

1. All personnel ______ go to the fire point if there is a fire.
2. You ______ to enclose the invoice. It will be sent separately.
3. You ______ press this material with a hot iron as it is too sensitive.
4. The database ______ you to search for client names and addresses.
5. The speed with which a modem ______ process data is measured in bits per second (bps).
6. We ______ network these computers because the systems are not compatible.
7. We ______ check the temperature regularly to make sure it doesn't rise.
8. Here is a list of things we ______ do to improve quality, and now we ______ prioritize them.
9. Leftover chemicals ______ be disposed of safely.
10. Do not use with other products as it ______ release dangerous fumes.

Задание 9. *Ответьте на вопросы, используя модальные глаголы*

1. What time must you get up at work days?
2. When do you have to come to work?
3. Where can you go for lunch when you are at work?
4. What do you have to do at work?
5. How many days holiday can you have every year?
6. Do you have to go away on business?
7. How often do you need to raise the level of your professional skills?
8. Do you have to work at weekends? If yes, how often do you have to?
9. Can you choose the time to go on holiday? If you can, which season do you prefer?
10. Can you get any bonuses at you work? What can you get them for?
11. Can you have any job promotion after you graduate from the university? What position can you get?

***Задание 10.** Изучите грамматический материал ниже и выполните задания*

Conditional Sentences *условные предложения* могут выражать реальные (условные предложения I типа), маловероятные (условные предложения II типа, нереальные условия (условные предложения III типа).

Выделяют также нулевой тип условных предложений. Этот тип описывает ситуации, при которых выполнение условия из придаточного предложения неизбежно повлечет за собой результат, указанный в главном предложении. В условных предложениях **нулевого типа** и в главном и в придаточном предложениях используется **Present Simple**.

Например: If a rock **is** permeable, it **allows** water or other fluids, such as oil, to pass through it. − *Если порода проницаема, она позволяет воде и другим жидкостям, таким как нефть, просачиваться.*

If you **press** the button, the light **turns** on. − *Если нажать кнопку, включается свет.*

Первый тип условных предложений в английском языке отвечает за «реальное» условие действия, представленного в предложении. События этого условного предложения относятся к будущему времени. Во всех условных предложениях обязательно будут присутствовать такие союзы, как **if** *если*, **when** *когда*, **as soon as** *как только*, **before** *до того как*, **till, untill** *до*, **after** *после* или другие. Особенностью этого типа условных предложений является тот факт, что простое будущее время (will + глагол в первой форме) употребляется лишь в главном предложении. В придаточном предложении после указанных союзов мы используем только простое настоящее время (Present Simple). Переводить его мы все равно будем будущим временем.

Например: If you **follow** the instruction, you **will repair** the fault successfully. − *Если следовать инструкции, можно успешно устранить поломку.*

Второй тип условных предложений в английском языке выражает маловероятное условие, которое может относиться как к настоящему, так и к будущему времени. Для того чтобы образовать такой тип условного предложения, необходимо в придаточном предложении употребить глагол в форме простого или длительного прошедшего времени (**Past Simple** / **Past Continuous**), а в главном предложении создать сложную форму сослагательного наклонения из глаголов **should / would** и простого инфинитива глагола без to. Если же в придаточном предложении мы имеем глагол **be**, то его формой сослагательного наклонения будет **were** для всех лиц. Помимо глаголов **should / would** можно употреблять модальные глаголы **could / might**

Например: If I **had** an instruction manual, I **would be able** to repair the device. – *Если бы у меня была инструкция, я бы смог починить прибор.*

Третий тип условных предложений в английском языке характеризуется своим отношением к нереальным действиям. В этих предложениях нереальное условие относится к прошедшему времени, а значит, выполнению не подлежит никоим образом. При создании таких предложений нам понадобятся глаголы **should / would** (модальные глаголы **could / might**) с перфектным инфинитивом без to для главного предложения и глаголы в форме прошедшего совершенного времени (Past Perfect **had + Past Participle**) в придаточном предложении

Например: If they **had replaced** old equipment, they **would have had** a lot of profit. – *Если бы они тогда заменили оборудование, они бы получили много прибыли*.

Задание 11. *Переведите на английский язык и дополните условные предложения*

1. Если бы я покупал(а) машину, я бы купил(а) …
2. Если бы я поступил в университет раньше, то …
3. Если я хорошо подготовлюсь к экзаменам, то …

4. Я был(а) бы счастлив(а), если бы …
5. Если бы в прошлом году не повысились цены, то …
6. Если бы у меня была возможность поехать в отпуск, то …
7. Если я уезжаю куда-то, то …
8. Когда я отдыхаю, то …
9. Если я должен (должна) был(а) работать в выходные, то …
10. Когда у меня плохое настроение, то …

Задание 12. *Изучите грамматический материал ниже*

Причастия. В английском языке есть причастие настоящего времени (Participle I), причастие прошедшего времени (Participle II) и Perfect Participle. Причастие – это неличная форма английского глагола, которая имеет свойствами глагола, наречия и прилагательного.

Причастие настоящего времени образуется при помощи окончания **-ing.** Причастие настоящего времени совпадает по форме с герундием, который также имеет окончание **-ing**, но их можно различить. Причастие по значению ближе к прилагательному, а герундий – к существительному.

Причастие прошедшего времени также имеет свойства глагола, прилагательного и наречия. Оно имеет лишь одну неизменяемую форму (это третья форма неправильного глагола или **-ed** форма правильного). Причастие прошедшего времени в английском языке соответствует русскому страдательному причастию.

тип причастия	**действительный залог**	**страдательный залог**
Participle I	**watching**	being watched
Participle II	–	watched
Perfect Participle	having watched	having been watched

Причастие настоящего времени обозначает действие, одновременное с действием, выраженным сказуемым. Причастие настоящего времени употребляется для образования времён группы Continuous.

Причастие прошедшего времени (Participle II) употребляется для образования совершённых (перфектных) времён (Present Perfect / Past Perfect). Причастие прошедшего времени также употребляется для образования страдательного залога.

Причастие прошедшего времени употребляется в функциях:

1. **именной части составного сказуемого** после глаголов: **be** *быть*, **feel** *чувствовать*, **look** *выглядеть*, **get** *становиться*, **become** *становиться*, и др. В этом случае Participle II переводится на русский язык страдательным причастием, прилагательным или наречием.

*Например:*The equipment is **broken**. − *Оборудование сломано.*

2. **определения.** Причастие может находиться как перед существительным, так и после него.

Например: The bridge **built** across the river is very reliable. − *Мост, построенный через реку, надежен.*
The **built** bridge let travel from one part of the city to another much faster. − *Построенный мост позволил быстрее путешествовать из одной части города в другую.*

3. **обстоятельства времени.** В этой функции причастие отвечает на вопрос: когда? А в функции **обстоятельства причины** на вопросы: почему? по какой причине?

Например: When **heated** ice melts. − *При нагревании лед тает.*

4. сложного дополнения с существительным в общем падеже или местоимением в объектном (не именительном) падеже.

Например: They heard the engine **started**. − *Они услышали, что двигатель завелся.*

Задание 13. *Дополните предложения, образовав необходимую по смыслу форму причастий от глаголов в скобках*

1. I know the man ______ *работающего* (work) in this sphere science.
2. We speak about the specialization ______ *основанного* (base) on descriptive courses and elementary practical training.
3. ______ *Ожидая* (Wait) for her they were watching TV programmes about famous artists.
4. If ______ *изучая* (study) the full range of subjects you will become a good specialist.
5. The ______ *начинающий* (begin) scientist studied the explosives in his father's laboratory.
6. He had never been to school or University but had studied privately and by the time he was twenty was a skilful chemist and excellent linguist ______ *владеющий* (master) Swedish, Russian, German, French and English.
7. When ______ *нас спросили* (ask) we were surprised.
8. They saw a ______ *сломанный* (broke) apparatus in the laboratory.
9. We used ______ *соединяющие* (connect) components to assemble this device .
10. They were happy ______ работая (work) with equal skill in every branch.
11. He was the first scientist in Russia ______ *использующий* (introduce) the microscope.
12. He was also one of the greatest Russian scientists who later became the first ______*избранный* (elect) President of the Academy of Sciences.

Задание 14. *Выберите из приложения текст по профилю подготовки и письменно переведите его*

Задание 15. *Напишите рассказ о своей будущей профессии (10 – 15 предложений) и запомните его*

КОНТРОЛЬНАЯ РАБОТА №3

Задание 1. *Изучите грамматический материал ниже*

Инфинитивы - неличные формы глагола, обозначают только действие, не указывая ни лица, ни числа, отвечают на вопросы: что делать? что сделать? Формальным признаком инфинитива в английском языке является частица **to**, которая перед инфинитивом в некоторых случаях опускается.

Инфинитив в английском языке имеет четыре формы в действительном (активном) залоге и две в страдательном (пассивном). Формы страдательного залога имеют лишь простой и совершённый инфинитив переходных глаголов, т.е. глаголов, употребляемых с дополнением.

тип инфинитива	**действительный залог**	**страдательный залог**
Indefinite	**to do** **to finish**	**to be done** **to be finished**
Continuous	**to be doing** **to be finishing**	нет
Perfect	**to have done** **to have finished**	**to have been done** **to have been finished**
Perfect Continuous	**to have been doing** **to have been finishing**	нет

Инфинитивы могут употребляться в следующих функциях:

1. **Подлежащее**. В этой функции инфинитив стоит в начале предложения, перед сказуемым, и переводится неопределенной формой глагола, или существительным.

Например: **To make this car go faster** means to change its design totally. − *Заставить эту машину двигаться быстрее значит кардинально изменить ее конструкцию*.

Сложное подлежащее (Complex Subject *субъектный инфинитивный оборот*) представляет собой сочетание существительного в именительном падеже или личного местоимения в именительном падеже, выполняющего в предложении функцию подлежащего с инфинитивом. Эта конструкция строится по следующей схеме: подлежащее (существительное в общем или местоимение в именительном падеже) + сказуемое (обычно глагол в страдательном залоге) + инфинитив.

Например: This **equipment is proved to be** the most reliable. – *Оборудование подтвердило свою надежность.*

2. **Именная часть составного сказуемого.** Следует за глаголом-связкой **be (am, is, are, was, were,** …), который иногда переводится как *значит, заключается в том, чтобы***.**

Однако эта же конструкция используется и в значении долженствования, где глагол to be выступает в роли модального глагола (Составное глагольное сказуемое).

Отличить одно значение от другого можно по тому, что подлежащее в предложении с глагольным сказуемым обозначает лицо или предмет, который может сам осуществить действие, выраженное инфинитивом.

Например: He **is to master** new technology a short time. (глагольное сказуемое). – *Он должен овладеть новой технологией в короткий срок.*

3. **Часть составного глагольного сказуемого** с модальными глаголами, за которыми инфинитив употребляется без частицы **to.** Исключения составляют **have to** *должен, вынужден***, ought to** *должен, следует (моральный долг, обязательство)* и т.д.**,** за которыми инфинитив ставится после частицы **to.**

Например: You **ought to** apologize. – *Тебе следует извиниться.*

I **have to** finish my report by the end of the week. – *Я должен закончить доклад к концу недели.*

4. **Дополнение.** После глаголов, выражающих приказание, просьбу, побуждение: **tell** *говорить*; **order** *приказывать*; **command** *приказывать*, **make** *заставлять*; **cause** *заставлять, принуждать*;

induce *побуждать*; **compel** *вынуждать, принуждать*; **ask** *просить*; **request** *просить*; **advise** *советовать*; **allow** *разрешать*; **enable** *давать возможность*; **forbid** *запрещать* и т.д.

Например: If you **want to stop**, release the lever. – *Если вы хотите остановиться, отпустите рычаг.*

A troubleshooting guide **explains how to solve the problems**. – *Инструкция по устранению недостатков объясняет, как решить проблемы.*

После многих прилагательных в сочетании be (am / is / are или was / were) + прилагательное + to инфинитив

Например: The engine **is ready to start**. – *Двигатель готов к запуску.*

It **was impossible to repair** the damage. – *Было невозможно устранить повреждение.*

Сложное дополнение (Complex Object *объектный инфинитивный оборот*). Состоит из существительного в именительном падеже или личного местоимения в объектном падеже и инфинитива. Эта конструкция строится по следующей схеме: подлежащее + сказуемое в действительном залоге + существительное в именительном падеже или личное местоимение в объектном падеже + инфинитив. После глаголов чувственного восприятия: **hear** *слышать*, **see** *видеть*, **watch** *наблюдать, смотреть*, **feel** *чувствовать*, **observe** *наблюдать*, **notice** замечать и др., **make** *заставлять*. После этих глаголов инфинитив употребляется без частицы to.

При переводе конструкции на русский язык, почти всегда используется придаточное предложение.

Например: We **want + all operating problems + to be solved**. – *Мы хотим, чтобы все текущие проблемы были решены.*

The low pressure **causes + the valve + to close**. – *Низкое давление заставляет клапан закрываться.*

5. **Определение.** Инфинитив стоит после существительного, неопределенного местоимения, порядкового числительного и отвечает на вопрос какой?. Инфинитив Indefinite Active, то он чаще переводится неопределенной формой глагола.

Например: There was a strong possibility **to damage** the device. – *Существовала большая вероятность повредить устройство.*

Инфинитив в функции определения часто выражает возможность, способность или долженствование и переводится придаточным определительным предложением, обычно с союзом который.

Например: The preliminary analyses **to be produced** can take three weeks. – *Предварительный анализ, который необходимо произвести, может занять три недели.*

6. **Обстоятельство.** Отвечает на вопросы зачем?, почему? и т.п. Может стоять в начале и в конце предложения. Переводится на русский с союзом **чтобы, для того чтобы**.

Например: **To break** pieces of rock there are special tools at the ends of each robot arms. – *Чтобы разбить куски породы, существуют специальные приспособления на концах рук робота.*

To get the equipment in time you should pay in advance. – *Чтобы вовремя получить оборудование, вам необходимо внести предоплату.*

Задание 2. *Переведите предложения, содержащие инфинитивы*

1. To solve the problems of environment protection we must create ecological data banks with the state and local authorities and businessmen's support.
2. Experiments allowed him to discover the properties of new chemical elements.

3. To prevent water entering the cavity of the wall, moisture barriers are used on the external surface and vapour barriers are used on the internal face.
4. Sound-deadening material is used to reduce sound passing from one room to another.
5. Peat is considered to be the lowest grade of coal because of its high water content.
6. My job is to make holes in rocks so that the samples of the rock can be taken and to insert explosives for blasting.
8. To check whether there is any oil at a site an exploratory well, or wild cat id to be dug.
9. Cracking process uses heat, pressure and catalysts to break up large molecules of heavy hydrocarbons into small molecules of light hydrocarbons.
10. Collectors are special devices to remove solids from the gas.
11. It also allows the rover to go over high rocks.
12. To prevent a car from moving pull a parking brake.
13. I'm pleased to report that our synthetic motor oils provide extremely fast lubrication of moving parts.
14. Incineration isn't the safest way to utilize plastics.
15. Cables consisting of several copper wires each with a shield are known as twisted pair cables.
16. To send out information is to transmit.
17. Nuclear power plants began to be commissioned from mid-fifties.
18. The high voltage electricity transmission network was created in order to transport electricity over long distances from big power plants.

Задание 3. *Переведите незаконченные предложения и дополните их, используя инфинитивы и инфинитивные конструкции (Complex Object, Complex Subject)*

1. Я поступил в KuzSTU, чтобы …
2. Я хотел бы …
3. Первое, что я сделаю, как сдам экзамены − это …
4. Если я не знаю, как пользоваться чем-то, то я …
5. Я думаю, что самая трудная вещь − это …
6. Я уверен, что …

7. Моя давняя мечта − это …
8. Я хочу, чтобы мои близкие …
9. Учеба, оказывается …
10. Образование без сомнения необходимо для …

Задание 4. *Изучите грамматический материал ниже*

В английском языке есть несколько **способов выражать будущие** ситуации:

1. простое настоящее время (**Present Simple**) может употребляться для указания на действие в будущем, если речь идет о циклических, повторяющихся событиях или действие происходит согласно определённому расписанию, графику или программе. Форма простого настоящего времени также используется в придаточных предложениях времени и условия.

Например: The exhibition opens in May and closes in June. − *Выставка откроется в мае и завершит работу в июне.*

The plane arrives at 10.30. − *Самолет прибывает в 10.30.*

2. настоящее длительное временя глаголов (**Present Continuous**) для выражения ранее намеченного действия или события, и если для этого были выполнены или выполняются другие подготовительные действия, есть договоренность.

Например: When are we moving to a new administrative building? − *Когда мы переезжаем в новое административное здание?*

We are starting the conference in 5 minutes. − *Мы начинаем конференцию через 5 минут.*

3. **be-going-to** *собираться что-то делать.* Употребляется, когда принято решение выполнить какое-либо действие или какие-либо действия предсказываются, основываясь на имеющейся информации.

Например: We are going to use plastic packaging. − *Мы собираемся использовать пластиковую упаковку (принято решение).*

The substance is going to dissolve in the solution. − *Вещество раствориться (собирается раствориться) в растворе (анализируем ситуацию).*

4. Глагол **will** употребляется для выражения:

1. внезапного, не запланированного решения свершить какое-либо действие

Например: Your colleague: Our boss called when you were out.

You: OK. I'll call him back. − *Ваш коллега: Звонил начальник, пока тебя не было. Вы: Хорошо. Я перезвоню.*

2. высказывания мнения, предположения, прогноза погоды, результатов спортивных состязаний

Например: I think the delivery will be delayed. − *Я думаю, что поставка будет задержана.*

Задание 5. *Напишите 10 предложений о том,*

1. что вы собираетесь делать в будущем, личных планах на ближайшее будущее;

2. как вы представляете вашу жизнь через 5 лет.

Задание 6. *Прочитайте текст и кратко обобщите основное содержание прочитанного (10 −15предложений).*

Exercises That Will Make You A Better Engineer

Posted on 23rd Jul 2013 by Bogdan Carstoiu in CEO's Blog

It is so easy to distinguish an engineer (or an engineer to be) from a non-engineer. When we interview people for a software engineering position, we want to determine how much of an engineer the candidate is. That's why we ask a fair amount of questions apparently unrelated to software. Real engineers focus on the problem, break it into pieces, and analyze them. They translate the problem into their "own words", making analogies with common, easy-to-understand processes. Once their solution is challenged, they are able to optimize and explain it.

Non-engineers on the other hand tend to scratch the surface of the problem and come up with a quick solution. When challenged with questions, they get defensive saying that it's not something they ever studied or ever did and that's why they cannot propose a better solution.

The truth is not everyone is born to be an engineer. And still, many schools pretend to be able to train people in becoming one. Jokes aside, engineering is not something you are born with, well … maybe exceptional capabilities. Anyone can train to become a decent engineer. Unfortunately, schools are not of great help. For example, software engineering schools train students in a lot of things, because knowing as much as possible about computers is definitely good. Certainly, it's necessary, but not enough.

Computing helps people and the final goal of a software engineer is to make things possible. Of course, the way things are built matters, but the final objective is to improve someone's life. Many times, engineers forget about the final goal, usually because they are educated to focus on the inner layers.

Fortunately, there are ways you can train yourself to become a better engineer.

1. Ask Yourself Questions. A Lot Of Them!

I do not mean questions related to your work (I assume you are already doing this), but situational questions in general. In short, be inquisitive. I remember that, when I was about seven years old, I noticed that generally the braking distance does not depend on the car weight. For almost a month, I tried to find an explanation for it…

It might seem pointless to ask yourself questions for which you can very easily find the answer on the Internet, but training your brain is really a good thing. Some people prefer to lift weights, you should lift problems.

2. Validate Your Findings.

Assuming you've already found some answers, do some research on the Internet. Understanding how far your approach was from ideal may be very rewarding.

3. Put Yourself In Charge.

There are many ways to do a specific thing, but some ways are better than others. Engineers are change agents. You can imagine what would have happened if Einstein had taken everything for granted. Yes, I think Einstein was a great engineer, as he was able to connect the dots.

4. Learn How To Ask Questions.

No matter who you ask questions – yourself or others, there has to be a process that starts with the overall picture and ends with the last detail. To me, the process of asking questions is very much like Google Maps. First, you get the picture of the entire region and afterwards you may zoom in. The basic set of questions imply at least a "what", a "how", a "when", and a "where". Sometimes, you may need to ask more, but always ask "what" and "how" (in this order).

Having a strategy for asking questions is one of the most important things you can do – never break the rule and try to make other people follow the process. Otherwise, simple things like meetings, for instance, can turn into mess.

5. Don't Be Afraid Of Making Mistakes.

Great engineers make big mistakes. People who do not want to make mistakes live by the book. For example, in software engineering there is a solution for almost anything. All you need is a little bit of research. I like it when people still try to build greater things, even though they failed in the past. It's really no shame to fail. With engineering in particular, lots of things can go wrong and many lands remain unexplored. Because most people choose to walk the line.

I do not particularly like people who give up once they discover that other people tried the same thing and failed. Before anything else, it is important to understand why other attempts failed. Just because other people failed doesn't mean you should abandon.

6. Don't Be Afraid Of Fixing Mistakes.

Always fix and improve. For example, very few people are able to acknowledge mistakes and fix them. When it comes to engineering, denying mistakes leads to extremely poor results. In software engineering, this may turn out to be a big issue, because things can get crazy when you somehow know that a component is broken and, instead of fixing it, you simply wrap it up with layers that eventually try to deal with the source of failure.

7. Befriend The Impossible.

If you assume something is not going to happen simply because chances are slim, bad news – it will in fact happen at the worst moment possible. As an engineer, try to identify the things that got overlooked and anticipate the worst-case scenario; there might be a few. Predicting the unpredictable is a highly important engineering task!

It is actually hard to be a good software engineer. Computing can be very anti-engineering, as it's closer to mathematics than to physics. The already known resolution is the best place to start. This makes people forget about engineering and, eventually, even promising engineers take the paved road.

Задание 7. *Выберите из приложения текст, соответствующий профилю подготовки, прочитайте его и обобщите содержание (10 – 15) предложений*

Задание 8*. Напишите рассказ об известном ученом / изобретателе и его вкладе в науку / изобретении (10 – 15 предложений) и запомните его*

Тексты для чтения и перевода

Texts for electrical engineers

What Is Electrical Engineering?

Electrical engineering is one of the newer branches of engineering, and dates back to the late 19th century. It is the branch of engineering that deals with the technology of electricity. Electrical engineers work on a wide range of components, devices and systems, from tiny microchips to huge power station generators.

Early experiments with electricity included primitive batteries and static charges. However, the actual design, construction and manufacturing of useful devices and systems began with the implementation of Michael Faraday's Law of Induction, which essentially states that the voltage in a circuit is proportional to the rate of change in the magnetic field through the circuit. This law applies to the basic principles of the electric generator, the electric motor and the transformer. The advent of the modern age is marked by the introduction of electricity to homes, businesses and industry, all of which were made possible by electrical engineers.

Some of the most prominent pioneers in electrical engineering include Thomas Edison (electric light bulb), George Westinghouse (alternating current), Nikola Tesla (induction motor), Guglielmo Marconi (radio) and Philo T. Farnsworth (television). These innovators turned ideas and concepts about electricity into practical devices and systems that ushered in the modern age.

Since its early beginnings, the field of electrical engineering has grown and branched out into a number of specialized categories, including power generation and transmission systems, motors, batteries and control systems. Electrical engineering also includes electronics, which has itself branched into an even greater number of subcategories, such as radio frequency (RF) systems, telecommunications, remote sensing, signal processing, digital circuits, instrumentation, audio, video and optoelectronics.

The field of electronics was born with the invention of the thermionic valve diode vacuum tube in 1904 by John Ambrose Fleming. The vacuum tube basically acts as a current amplifier by outputting a multiple of its input current. It was the foundation of all electronics, including radios, television and radar, until the mid-20th century. It was largely supplanted by the transistor, which was developed in 1947 at AT&T's Bell Laboratories by William Shockley, John Bardeen and Walter Brattain, for which they received the 1956 Nobel Prize in physics.

What does an electrical engineer do?

"Electrical engineers design, develop, test and supervise the manufacturing of electrical equipment, such as electric motors, radar and navigation systems, communications systems and power generation equipment, states the U.S. Bureau of Labor Statistics. "Electronics engineers design and develop electronic equipment, such as broadcast and communications systems − from portable music players to global positioning systems (GPS)."

If it's a practical, real-world device that produces, conducts or uses electricity, in all likelihood, it was designed by an electrical engineer. Additionally, engineers may conduct or write the specifications for destructive or nondestructive testing of the performance, reliability and long-term durability of devices and components.

Today’s electrical engineers design electrical devices and systems using basic components such as conductors, coils, magnets, batteries, switches, resistors, capacitors, inductors, diodes and transistors. Nearly all electrical and electronic devices, from the generators at an electric power plant to the microprocessors in your phone, use these few basic components.

Critical skills needed in electrical engineering include an in-depth understanding of electrical and electronic theory, mathematics and materials. This knowledge allows engineers to design circuits to perform specific functions and meet requirements for safety, reliability and energy efficiency, and to predict how they will behave, before a hardware design is implemented. Sometimes, though, circuits are constructed on "breadboards," or prototype circuit boards made on computer numeric controlled (CNC) machines for testing before they are put into production.

Electrical engineers are increasingly relying on computer-aided design (CAD) systems to create schematics and lay out circuits. They also use computers to simulate how electrical devices and systems will function. Computer simulations can be used to model a national power grid or a microprocessor; therefore, proficiency with computers is essential for electrical engineers. In addition to speeding up the process of drafting schematics, printed circuit board (PCB) layouts and blueprints for electrical and electronic devices, CAD systems allow for quick and easy modifications of designs and rapid prototyping using CNC machines. A comprehensive list of necessary skills and abilities for electrical and electronics engineers can be found at MyMajors.com.

Electrical engineering jobs and salaries

Electrical and electronics engineers work primarily in research and development industries, engineering services firms, manufacturing and the federal government, according to the BLS. They generally work indoors, in offices, but they may have to visit sites to observe a problem or a piece of complex equipment, the BLS says.

Manufacturing industries that employ electrical engineers include automotive, marine, railroad, aerospace, defense, consumer electronics, commercial construction, lighting, computers and components, telecommunications and traffic control. Government institutions that employ electrical engineers include transportation departments, national laboratories and the military.

Most electrical engineering jobs require at least a bachelor's degree in engineering. Many employers, particularly those that offer engineering consulting services, also require state certification as a Professional Engineer. Additionally, many employers require certification from the Institute of Electrical and Electronics Engineers (IEEE) or the Institution of Engineering and Technology (IET). A master's degree is often required for promotion to management, and ongoing education and training are needed to keep up with advances in technology, testing equipment, computer hardware and software, and government regulations.

As of July 2014, the salary range for a newly graduated electrical engineer with a bachelor's degree is $55,570 to $73,908, according to

Salary.com. The range for a mid-level engineer with a master's degree and five to 10 years of experience is $$74,007 to $108,640, and the range for a senior engineer with a master's or doctorate and more than 15 years of experience is $97,434 to $138,296. Many experienced engineers with advanced degrees are promoted to management positions or start their own businesses where they can earn even more.

The future of electrical engineering

Employment of electrical and electronics engineers is projected to grow by 4 percent between now and 2022, because of these professionals' "versatility in developing and applying emerging technologies," the BLS says.

The applications for these emerging technologies include studying red electrical flashes, called sprites, which hover above some thunderstorms. Victor Pasko, an electrical engineer at Penn State, and his colleagues have developed a model for how the strange lightning evolves and disappears.

Another electrical engineer, Andrea Alù, of the University of Texas at Austin, is studying sound waves and has developed a one-way sound machine. "I can listen to you, but you cannot detect me back; you cannot hear my presence," Alù told LiveScience in a 2014 article.

And Michel Maharbiz, an electrical engineer at the University of California, Berkeley, is exploring ways to communicate with the brain wirelessly.

The BLS states, "The rapid pace of technological innovation and development will likely drive demand for electrical and electronics engineers in research and development, an area in which engineering expertise will be needed to develop distribution systems related to new technologies."

Texts for mechanical Engineers

What is Mechanical Engineering?

Mechanical engineering is one of the oldest branches of engineering, dating back to when the first wheels were put to practical use by mounting them on an axle to make a cart. Throughout recorded history, people have been inventing and building increasingly more sophisticated devices and machines in order to improve the conditions of life. Many of the machines we encounter every day − cars, appliances, tools and climate control systems − were made possible by mechanical engineers.

"Mechanical engineering dates to ancient Greece and China, where mechanisms like screw pumps, steam engines, clocks, seismometers and even differential gears were invented," according to the American Society of Mechanical Engineers (ASME). Pioneers in the field − people who built the machines for which they became famous − include Archimedes (Archimedes' screw pump, block-and-tackle pulley, etc.), Johannes Gutenberg (movable-type printing press), James Watt (steam engine), Robert Fulton (steamboat), Eli Whitney (cotton gin) and Henry Ford (automobile assembly line).

One of the most significant drivers of innovation in the field of mechanical engineering, particularly in its earliest stages, has been war, according to the Viterbi School of Engineering at the University of Southern California.

"Mechanical engineers can create basic commodities that an every-day person would use, or other highly valued items for the military or government," the school's website states. Catapults, battering rams, chariots and siege towers were all the products of mechanical engineering. Many of the machines of modern warfare, such as armored vehicles, ships, aircraft, artillery and firearms, also owe their existence to mechanical engineers.

What does a mechanical engineer do?

Simply put, "mechanical engineering deals with anything that moves," according to the Fu Foundation School of Engineering and Applied Science at Columbia University. Mechanical engineers still use basic components that have been known and used for centuries − such as wheels, axles, levers, screws, springs and hinges − to make machines such as vehicles, farm machinery, household appliances, robots and industrial equipment. Mechanical engineers also design sub-assemblies for these machines, including control systems and instruments as well as individual parts.

Movement can be powered by the muscles of humans or animals, heat and pressure of combustion, hydraulic or pneumatic actuators, electromagnetism, gravity or springs of all shapes and sizes. Therefore, a mechanical engineer must be familiar with all of these basic motion and power components in order to design more complex devices. For instance, in an automobile, the starter motor uses electromagnetism; the engine is powered by expansive pressure from the combustion of gasoline; the power steering, brakes and automatic transmission use hydraulic pressure; and the suspension system uses springs.

Mechanical engineering is one of the broadest engineering disciplines, according to the U.S. Bureau of Labor Statistics (BLS). Mechanical engineers must have a basic working knowledge of many other areas of engineering, including structural, aerospace, computer and electrical engineering. Additionally, they should be familiar with instrumentation and control, manufacturing processes and materials in order to design devices that can be built efficiently and at a reasonable cost.

Critical skills needed in mechanical engineering are an in-depth understanding of physics, mathematics and materials. This knowledge allows engineers to calculate failure conditions based on the dimensions of a part, the properties of its material and the conditions under which it will operate. An engineer can then specify the required dimensions and materials of a part so it can withstand a given force.

Engineers work with many types of materials, including metals, ceramics, polymers and composites. In "Mechanical Behavior of Engineering Materials" (Springer, 2007), Joachim Roesler, Harald Harders and Martin Baeker write that it is very important for mechanical engineers to study the mechanical behavior of materials. Knowing the properties of these materials, such as their density, hardness, tensile strength, bulk modulus and bending strength, allows mechanical engineers to calculate how these materials will perform under stresses such as compression, tension, bending and twisting as well as under various environmental conditions of temperature, pressure, corrosive gasses and liquids, and even radiation. They also need to be able to predict how these materials will stand up over an extended period of time.

More and more, mechanical engineers rely on computer-aided design (CAD) and computer-aided manufacturing (CAM) systems, so proficiency with computers is essential. According to theUniversity of Pittsburgh website, "To design all the machines that use and produce power, today's mechanical engineers use CAD / CAM drawing programs to draft their designs exactly before any manufacturing and testing is done." In addition to speeding up the drafting process, CAD systems allow for quick and easy modifications of designs, three-dimensional (3D) visualization of finished parts and assemblies, and rapid prototyping using 3D printing and computer-aided manufacturing (CAM) software with computer numeric controlled (CNC) machine tools. A comprehensive list of necessary skills and abilities for mechanical engineers can be found at MyMajors.com.

Mechanical engineering jobs and salary

According to the BLS, "Mechanical engineers generally work in professional office settings. They may occasionally visit worksites where a problem or piece of equipment needs their personal attention. Mechanical engineers work mostly in engineering services, research and development, manufacturing industries, and the federal government."

For most jobs, mechanical engineers need at least a bachelor’s degree in engineering, and many employers, particularly those that offer engineering consulting services, also require certification as a Professional Engineer. A master's degree is often required for promotion to management, and ongoing education and training are needed to keep up with advances in technology, materials, computer hardware and software, and government regulations. Additionally, many mechanical engineers belong to the American Society of Mechanical Engineers.

According to Salary.com, as of July 2014 the salary range for a newly graduated mechanical engineer with a bachelor's degree is

$52,626 to $74,524. The range for a mid-level engineer with a master's and five to 10 years of experience is $73,238 to $108,609; and the range for a senior engineer with a master's or doctorate and more than 15 years of experience is $95,251 to $141,806. Many experienced engineers with advanced degrees are promoted to management positions or start their own businesses where they can earn even more.

The field of mechanical engineering is expected to grow. The BLS states, "Employment of mechanical engineers is projected to grow 5 percent from 2012 to 2022, slower than the average for all occupations. Job prospects may be best for those who stay abreast of the most recent advances in technology." Having good grades from a highly rated institution should give a job seeker an advantage over the competition.

Look for top-rated mechanical engineering programs at TopUniversities.com.

Jim Lucas is a freelance writer and editor specializing in physics, astronomy and engineering. He is general manager of Lucas Technologies.

Texts for chemical engineers

What is chemical engineering?

Chemical engineering is the study and practice of transforming substances at large scales for the tangible improvement of the human condition. Such transformations are executed to produce other useful substances or energy, and lie at the heart of vast segments of the chemical, petroleum, pharmaceutical and electronic industries.

Chemical engineering differs from chemistry mainly in the focus on large scales. The definition of "large" is a bit arbitrary, of course, but is set mainly by the scale of useful commercial production. Typically, this scale ranges from barrels to tank cars, whereas the chemist tends to be concerned about sizes ranging from vials to beakers.

Chemical engineering has been practiced in rudimentary form since at least the great Roman road-building projects that began about 300 B.C. The cement used for pavement was based on the contemporary Hellenistic formula employing lime, a calcined (heated) form of calcium carbonate. However, academic programs in the U.S. formally called "chemical engineering" ‒ or something similar ‒ originated only near the start of the 20th Century.

For many years, most chemical engineers took jobs in the oil or petrochemical industry. Job functions typically involved the development or operation of processes to convert oil-based feed stocks into energy or other useful chemical products ranging from fibers for clothing to lubricants to fertilizers. In recent decades, however, job descriptions have become far more diverse. Chemical engineers often develop or operate processes to create products ranging from integrated circuits to disease-fighting drugs to fuel cells. Some recent graduates use a chemical engineering bachelor's degree as a launching pad for careers as physicians or patent attorneys.

Have you ever washed a load of your laundry with Tide detergent? Or enjoyed a slice of DiGiorno pizza? If so, you have experienced the University of Illinois' Chemical and Biomolecular Engineering program firsthand. These products and those listed below were developed by our graduates.

What will you create?

• The world's smallest fuel cell • Foaming insulation • Tide® • DiGiorno® pizza • Wrigley® 5 gum • Pantene® shampoo • Cottonelle® tissue • Kleenex®	• Cascade® • Lays Stax® • Smirnoff Ice® • Budweiser® • Liquid Clorox 2® • Cheerios® • Chocolate Altoids®

What do Chemical Engineers Do?

It would take too long to list all the products that are impacted by chemical engineers, but knowing what industries employ them may help you comprehend the scope of their work.

Chemical engineers work in manufacturing, pharmaceuticals, healthcare, design and construction, pulp and paper, petrochemicals, food processing, specialty chemicals, microelectronics, electronic and advanced materials, polymers, business services, biotechnology, and environmental health and safety industries, among others.

Within these industries, chemical engineers rely on their knowledge of mathematics and science − particularly chemistry − to overcome technical problems safely and economically. And, of course, they draw upon and apply their engineering knowledge to solve any technical challenges they encounter. Don't make the mistake of thinking that chemical engineers only “make things,” though. Their expertise is also applied in the areas of law, education, publishing, finance, and medicine, as well as in many other fields that require technical training.

Specifically, chemical engineers improve food processing techniques, and methods of producing fertilizers, to increase the quantity and quality of available food.

They also construct the synthetic fibers that make our clothes more comfortable and water resistant; they develop methods to mass-produce drugs, making them more affordable; and they create safer, more efficient methods of refining petroleum products, making energy and chemical sources more productive and cost effective.

Chemical engineers also develop solutions to environmental problems, such as pollution control and remediation.

And yes, they process chemicals, which are used to make or improve just about everything you see around you.

Chemical engineers face many of the same challenges that other professionals face, and they meet these challenges by applying their technical knowledge, communication and teamwork skills; the most up-to-date practices available; and hard work. Benefits include financial reward, recognition within industry and society, and the gratification that comes from working with the processes of nature to meet the needs of society.

How do chemical engineers think?

The unique focus perspective of this discipline can be represented by an extension ladder, shown in the figure. The two uprights of this very useful tool represent the two primary physical foundations upon which all of chemical engineering rests: chemistry and transport. Here, "chemistry" refers to the rates and extents of transformation among substances; "transport" refers to the movement of mass, energy or momentum.

The rungs of the ladder represent the mathematical balance equations that connect chemistry and transport. The balance equations can be time-dependent or steady-state. Whatever their nature, however, these balance equations are rarely written in their own right; they are almost always written to optimize or control some variable within them. The rungs, therefore, also represent the use of balance equations for the optimization and control of useful commercial processes.

Chemical engineering embraces an enormous range of size scales in a fully integrated way − ranging from atoms to oil tankers. The figure represents this notion by three extension segments, representing length scales corresponding to the microscopic, the bench scale (or "unit operation" in the lingo of the discipline) and the factory. At the molecular level, the balance equations might incorporate variables like temperature or pressure. At the unit operation level, the key variables might be flow rate or controller gain. At the factory level, the variables might be operating cost or overall production rate.

The ladder idea provides more than a simple picture of the conceptual structure of chemical engineering, however. The idea also illustrates an important point about the use of this structure. Consider how a house painter uses a ladder. The skilled painter moves continually up and down the rungs as circumstances dictate. When carrying materials and brushes to the third floor, the painter may climb rapidly, covering a great deal of territory. When scraping the stubborn shavings from an old window, however, the painter may need to stay on one particular rung for a long time. Good painting requires a constellation of climbing skills integrated judiciously: knowing when to climb, when to descend, when to overlap ladder segments, how to lean, how to reach. Although these skills can be described and listed, they cannot be used algorithmically. Judicious ladder use requires judgment and experience (i.e., "ladder wisdom").

In a similar way, when we want to transform chemical substances, the "ladder" of chemistry/transport, balances, and optimization offers a versatile tool. The skilled chemical engineer moves continually over the span of length scales from atomic to factory-level as circumstances dictate. When designing or optimizing an overall process flow, the chemical engineer may move rapidly up and down the span of length scales. When troubleshooting a particular unit operation, however, the chemical engineer may need to stay at that level for a long time with just a few balance equations. Good chemical engineering requires a constellation of intellectual skills integrated judiciously: knowing what kind of balance equation to write, what control volume to use, what terms to neglect, when to overlap tools from different length scales, what mathematics to use. Although these skills can be described and listed, they cannot be employed algorithmically. Judicious chemical engineering requires judgment and experience (i.e., "chemical engineering wisdom"). Thus, chemical engineering has been aptly called the "liberal arts of engineering."

The ability to think quantitatively and interactively about chemistry and transport over many length scales, with wise judgment born of experience, underpins the true value-added contribution of chemical engineering. This ability probably forms part of the reason chemical engineers continue to enjoy high entry-level salaries.

What is Engineering Economics?

Engineering economics is the application of economic principles and calculations to engineering projects. It is important to all fields of engineering because no matter how technically sound an engineering project is, it will fail if it is not economically feasible. Engineering economic analysis is often applied to various possible designs for an engineering project in order to choose the optimum design, thereby taking into account both technical and economic feasibility.

Many basic economic principles may be applied in an engineering economic analysis, depending on their applicability. Time value of money is one such principle with wide applicability. This principle is used to calculate the future value of something given the present value, or the present value given the future value, at a given interest rate. For example, time value of money may be used to calculate how much a project will cost once it is actually completed; annual investments or withdrawals may also be calculated. A cash-flow diagram is often used to aid in the calculation of the time value of money.

When comparing costs among two or more possible alternatives, engineering economics may use either present or future worth analysis or annual cost. Present or future worth analysis converts all the costs of a project into equivalent present or future worth. The time period of analysis must be the same for all options for this method to be valid.

Annual cost analysis computes the annual rate of return for a project or projects. A value called the minimum active rate of return is also computed. Generally, a project must meet or exceed the minimum active rate of return to be considered feasible. If two or more projects meet this rate, other criteria are also considered.

For government engineering projects, a method called benefit / cost analysis is often used. This method converts the all benefits and costs of a project into monetary values, and then divides the total benefits by the total costs. As a general rule, the project is considered acceptable if this ratio is greater than one.

In manufacturing engineering, a method called break-even analysis is often used. This is used to determine the percent capacity for the manufacturing operation at which cost is equal to income. A company could use this method to determine the minimum amount it must produce in a month to turn a profit.

Engineers may also use economics to calculate depreciation of value. For example, they could calculate the value of a tool that a company is considering purchasing. Methods for calculating depreciation include book value, straight-line depreciation, and accelerated cost recovery system.

All disciplines of engineering employ engineering economics. Most university and college engineering departments require a course in engineering economics, or include economic analysis in other engineering coursework. Engineering economics is a required section of the Fundamentals of Engineering exam, which is required for engineers who desire to attain professional licensure.

What is Business Systems Engineering?

Business systems engineering is a detailed approach to identifying and implementing the business processes, tasks, and transactions that are required to successfully operate a business. The main component of this approach is business process engineering, which consists of a review of the business process, a detailed work flow map, and data analysis. Business systems engineering is usually undertaken during an expansion or in response to sky-rocketing operating costs. The goal is to find a cost-effective and efficient way to run a business.

A business process review is one part of business systems engineering. It involves identifying a series of elements within the business, including the objectives and activities of the business, with the goal of re-working the way the company does business. The specific processes used to produce a product and deliver it to the customer, as well as the support elements such as the materials, labor, and infrastructure, must be evaluated.

Another aspect of business systems engineering is work flow mapping. This is a graphical tool used by companies to illustrate the flow of materials and information required to complete an objective. It outlines the data in a sequential fashion to show how a specific job is completed from the initial concept to the finished product or service. The actual graph diagrams the work flow with specific symbols and may represent an entire process or just a portion of it. A work flow diagram can be adapted to different units within the company.

Business systems engineering also involves metrics, which are a standard measure against which performance is measured. Usually, these involve identifying key business indicators in specific areas such as marketing, manufacturing, and sales. Customer base and customer base growth rate are two indicators of progress in marketing. To evaluate manufacturing, the rate of production and volume of production are usually measured. Sales volume and percentage of returns are usually analyzed to evaluate how the sales department is doing.

A company usually conducts an evaluation of its business process when the economy slows down. As orders for the product or service decrease, the company generally looks for ways to reduce costs. This could including combining different units within the company or temporary halting production of a particular product.

During times of economic growth, a company may also evaluate its business process to expand and grow. This could include adding additional production lines or introducing new services. Also, the implementation of new systems generally requires the information obtained through business systems engineering.

Texts for mining engineers

What is mining engineering?

Mining engineering is an engineering discipline that involves the practice, the theory, the science, the technology, and application of extracting and processing minerals from a naturally occurring environment. However, mining engineering is associated with many other sister department within like geology, mineral processing and metallurgy, geotechnical engineering, surveying. A mining engineer manages all phases of mining operations – from exploration and discovery of the mineral resource, through feasibility study, mine design, development of plans, production and operations to mine closure.

With the process of Mineral extraction, some amount of waste and uneconomic material are generated which are the primary source of pollution in the vicinity of mines. Mining activities by their nature cause a disturbance of the natural environment in and around which the minerals are located. Mining engineers must therefore be concerned not only with the production and processing of mineral commodities, but also with the mitigation of damage to the environment both during and after mining as a result of the change in the mining area.

From prehistoric times to the present, mining has played a significant role in the existence of human race. Since the beginning of civilization people have used stone and ceramics and, later, metals found on or close to the Earth's surface. These were used to manufacture early tools and weapons. For example, high quality flint found in northern France and southern England were used to set fire and break rock.

Flint mines have been found in chalk areas where seams of the stone were followed underground by shafts and galleries. The oldest known mine on archaeological record is the "Lion Cave" in Swaziland. At this site, which radiocarbon dating indicates to be about 43,000 years old, paleolithic humans mined mineral hematite, which contained iron and was ground to produce the red pigment ochre.

The ancient Romans were innovators of mining engineering. They developed large scale mining methods, perhaps most notably the use of large volumes of water brought to the mine head by numerous aqueducts for hydraulic mining. The exposed rock was then attacked by fire-setting where fires were used to heat the rock, which would be quenched with a stream of water. The thermal shock cracked the rock, enabling it to be removed. In some mines the Romans utilized water-powered machinery such as reverse overshot water-wheels. These were used extensively in the copper mines at Rio Tinto in Spain, where one sequence comprised 16 such wheels arranged in pairs, lifting water about 80 feet (24 m).

Black powder was first used in mining in Banská Štiavnica, Kingdom of Hungary (present-day Slovakia) in 1627. This allowed blasting of rock and earth to loosen and reveal ore veins, which was much faster than fire-setting. The Industrial Revolution saw further advances in mining technologies, including improved explosives and steam-powered pumps, lifts, and drills as long as they remained safe.

What do mining engineers do?

Over a span of nearly forty years consulting to the mining industry, I have worked with many mining engineers. On the basis of long experience, I can say with confidence that mining engineers spend most of their time in meetings, listening to consultants and staff and making hard decisions about the mine they work for or manage.

When they are not in meetings, the mining engineers that I have known drive around the open pit, or descend the underground workings where they walk around to see if things are going as they should. And if things are not going as they should, they talk (mostly) to the people who are supposed to be making things go properly and the mining engineers remind them of their duty and the consequences of failing to live up to their duty.

Sometimes the mining engineers leave the mine and go to the office building in some distant city where the head office is located. There they meet with even more senior mining engineers, accountants, and lawyers to discuss the legal and financial operation of the mine they manage back home. Then they go to a fine restaurant for supper and a night in an expensive hotel to fly back, first-class, to the mine the next day.

I do not wish to imply by this brief overview of the daily life of the average mining engineer that their work is easy. For the variety and challenge lies in the diversity of topics and issues the mining engineer will face each day in those meetings and round-the-mine travels. Today the mining engineer will be faced with a decision to purchase or not to purchase land next to the mine where there may or may not be additional ore to expand the mine. The next day the mining engineer will be asked by the chief exploration geologist for an increase in budget to enable more drilling to be undertaken on the land that was purchased the day before.

That afternoon the permitting department will demand additional staff to negotiate the permits for off-site drilling and disposal of the resulting muds from the drill rig. The health and safety officer will be insisting that the necessary health and safety plans are not in place and that new work be put on hold until the necessary documents are approved.

The next day the topic of the meeting is a shortage of equipment to expand pit operations to the projected high-grade zone. Then a meeting on dwindling capacity in the tailings impoundment and the cost of expanding the impoundment or using the old worked-out open pit. That leads to a full-scale review of operating budgets with the planners and accountants just arrived on site from head office. They are under instructions from the directors to increase profit by cutting expenses; none of the mill managers or equipment operators can see the sense of this, for they all need new equipment to replace the old stuff.

To check if the mill superintendent really does need new equipment, the mining engineer takes a trip to the mill. He has never really understood the intricacies of this mill and he knows the mill super is smarter than he is and has been around a lot longer. They banter good-naturedly for a while. They walk around the equipment which all seems unrusted and humming. Production numbers are steady; the preventive maintenance program is functional. The equipment replacement costs are huge, and the mill super persuasive. The mine manager knows what to do: kick the decision up to the head-office mechanical engineers. Let them take the fall or praise for wrong or right decisions and the need to find more money.

The mining engineers that I write of here, may have received their degree at Colorado State University, Queens, the University of British Columbia, or one of the other few places that still award mining engineering degrees to a small cadre of students. They will have studied, like most engineers, basic maths, physics, chemistry, and calculus. Then a few courses in basic mining theory: what makes an underground mine; the essence of open pits; basic blasting theory; and maybe a bit of finance and accounting. Maybe a short course on environmental studies, social policy, sustainable propaganda, and community relations.

The mining engineering student would have helped out at a few conferences where professors and consultants market to each other via papers based on case histories and ideas recirculated from decades past. The student will have met the leaders of industry and recruiting agents for big and mid-sized mining companies. Well before graduation, the offers would have come in. Salaries of from $65K to $100 K depending on the size of mine, the personality of the student, academic record, and remoteness of mine site. The best students would have been flown first class to Nevada and the mine of choice, put up in a fine hotel in Toronto, and promised car and first month of rent on an apartment. Thus the entry into the mining work place.

Let us call her Linda. She graduated as a mining engineer in Australia. She met and married her husband at university where he did a masters in mine planning and operation. She preferred the work face: into water-proof clothes, down the shaft, through the mud to the drills and rock. I met her at a mine in the far north of Canada to which she and her husband were transferred. She was then chief mining engineer and had to guide me and her underlings through upper management review of a decision to expand the tailings facility. She was beautiful, smart, and very demanding. We always prepared thoroughly for meetings with her, for she could bore down into the details faster than any other person that I have ever met.

Yet she was kind and gentle. When we were ready to present to upper management, she grilled us and made us practice until we were word perfect. Then she would introduce us to the assembled finance committee and support us to success. I readily admit that it was her skilled judgment about what to say and what to leave out that led us to win every budget battle and get senior management approval for all our proposals.

Now she and her husband are in London, England at company headquarters and I am told that she is guiding the making of multi-million dollar decisions each day. I can believe that, for she has the skill. Her husband is still in a back engineering office planning new mines and avoiding the spotlight.

There are generally few mining engineers at a mine. There are sure to be more mechanical, chemical, and civil engineers than mining engineers at a typical mine. For there is a lot more mechanical, chemical, and civil work than mining work to be done at the typical mine. The mining engineer however is the boss, the mine manager, the chief mine planner, the executive officer, the primary decision maker. The mining engineer aims to leave the management of the mine to a younger souls and move up the ladder to head office, there to buy and sell mines, negotiate deals, and set budgets and schedules.

Some mining engineering graduates go on to do a masters degree − and then go into consulting, for a masters is the working degree of consulting to the mining industry. And if you are a mining engineer without a masters but about ten years practical experience at mines, you too can come to the city to work for a consultant. I have worked with mining engineers in consulting who design the underground workings or layout the new open pit mine. They run computer codes that simulate material movements, calculate operating costs, and schedule repairs. They use computer codes to calculate slope stability, quantify overburden stripping ratio, and hence establish the economics of an ore body in a cold northern land.

A month ago, I sat in a tall glass building in Santiago, in a cool room of expensive finishes. The consultant mining engineers presented fifty slides on the cost estimate for a new mine to be brought into production in 2020. The consultants had reviewed three previous cost estimates made by other consultants in the past five years and had sought to bring precision and accuracy to the wildly varying previous estimates. The new consultants spent twenty minutes on the issue of the daily cost to feed a worker at the fly-in, fly-out camp. At least one mining engineer had spent the past month researching this issue.

We civil engineers then botched things up. We presented brief, detail-less slides telling that the cost of tailings disposal would exceed $2 billion. “Do you have detail for that?” the client’s mining engineers asked. “Not really,” the reply. “For the cost depends on so many things out of our control, and in the control of you the mining engineer, that we thought it best for you to do it.”

The mining engineering consultants jumped at the chance and are still working on this one as far as I know.

The point is that mining engineers span the range from the most detailed oriented to the highest, big-picture thinkers. As in all branches of engineering, there are the creators, the dreamers, the idealists, the philosophers, the soldiers, the warriors, the workers, those who inspire, those who manage, those who lead and those who follow.

Some work in the dust of the veldt, in the heat of the desert, in the snow & cold of the north, in the rain of the tropics, and in dangerous and remote places. Some prefer the delights of big cities, rapid transit, impossibly high rents, and school costs, and the comfort of multi-stories, air-condition towers. Some like the gray, cool stone of research universities. Some like the hustle of organizing conferences and competing as academics with honest consultants.

Some write books, some write EduMine courses, some churn out academic papers on socially responsible mining and sustainable development. Some go work for investment firms where they use advanced statistics to pick potential stock winners and losers.

Some found their own junior mining companies. With geologists, they find new ore bodies, engage drillers, write press releases, list stocks, encourage investors, skim a few dollars, and succeed or fail as the market fluctuates in response to Chinese demand. Some junior mining company mining engineers go bankrupt. Some go on to fortunes, when they sell out to a mid-sized company. They thrill to the trek into the forest, and peering through a magnifying glass at visible gold in a core specimen. They thrill to the sound of a drill rig echoing in the canyon, the thud of a box of new core, and the geologist's remarks on grubby paper: ore heavy with silver.

Some mining engineers prefer the three martini lunch with rich investors come from European and Arab capitals. They thrill to the haggle of money invested, dividends promised, the daily movement of share price, the speculation of the take-over bid, and the large check that quantifies the gamble and its success. They wear pin-striped suits of impeccable cut set off by ties of silk and high price. They pity their cousins in torn jeans, T-shirt, steel-toed boots, and the dust of a hot land rover somewhere in an African country. Certainly they would not change places one with the other.

I have never met a mining engineer working for a regulatory agency. Admittedly there are some in MSHA, OSHA, and other Washington agencies overseeing the USA mining industry. Their work is critical to mine safety, and their publications (which I read avidly) are impeccable and impressive. These are a small part of the mining engineering fraternity. They prove the immense diversity of mining engineering pursuits and endeavors. They demonstrate that if you choose to study mining engineering that is only the beginning. Once graduated there is an infinite variety of opportunities out there just waiting for you to choose one or more lifestyle that suites your instincts, interests, abilities, and life-style choices.

Keep in mind that you do not have to study mining engineering to enter the mining industry. You could become a civil engineer and develop mining infrastructure: the roads, bridges, shafts, structures, and tailings facilities that are key to mining. You could become a mechanical engineer: manage the shovels, the trucks, the crushers, and spreaders, and the pipes and pumps of the mine. You could become a chemical, process, or metallurgical engineer and oversee extraction of minerals from the ore. Or become an environmental engineer and take care of air quality, surface water and groundwater quality and all the other potential impacts of a mine on its surroundings.

Lawyers and accountants, human resource professionals, and health and safety specialists are needed at the mine. If you like working with people and communities, study community relations and then go mining. All of these professions bring personal and financial rewards at mines far and near.

As a mining engineer, you may have to lead and manage all these professionals. In addition you will have to deal with labor unions, politicians, NGOs, terrorists who would burn down your core shack, and journalists come to write sensational stories of the impact of the mine on native peoples. You will have to be the face of the mine and the mining industry in the community. You will have to open schools and hospitals, attend sports events, and give presentations at learned conferences.

You as a mining engineer will travel far and wide. You will work in Africa, Australia, Nevada, Chile, and the cold parts of Sweden and the Yukon. You will move your family often and your wife and children will attend many schools and learn many languages. You will be part of a small, but international community. You will meet at the SME conferences in western cities of the USA. You will share stories of hardship, challenges overcome, of mines opened and closed, of political movements and environmental forces that are even now changing the way we see and implement mining.

You will thrill to elections and the appointment of a new EPA administrator. You will fight law cases to the Supreme Court to get the permits you need to open a new mine and close an old one. You will travel the wilds of Spain and the places where they have mined gold for

2,000 years as you seek to get community support to reopen an old Roman mine and provide jobs to but 400 of 4,000 applicants thrown out of work by crazy German bankers intent on cutting national budgets. You will have to articulate the benefits of mining to native groups who believe fish transcend profit; to historians who value ruins over new mills; to the rich who live around big copper deposits and do not want their retirement homes impacted by heavy equipment.

In the next twenty years, as a mining engineer, you will have to redefine how we go about mining: do we only high grade and filter press the tailings to dry stacks? Do we avoid sensitive areas and only operate in remote deserts? Do we desalinate sea water to make mining possible in deserts where people would rather not live, or do we undertake perpetual water treatment in wet climates that are getting warmer by the year and subject to bigger and bigger storms and flood? Do we reopen historic mines in Spain and Romania where unemployment is rife? Or do we go to the Amazon and Zambia and deal with tyrants in Zimbabwe and South Africa who would nationalize our finds and our mines created by long education and hard work?

For the future of mining is not a repeat of the old ways. If we are to prosper as societies, we need to mine in new ways. And the future of mining and the benefits of civilization depend on the ideas and skills of mining engineers yet to be educated. I am optimistic. For I have children and grandchildren who reject my opinions and prejudices. So too I am privileged to work with young engineers who reject my ways and perspective. They and you, as a young mining engineer, will have to overthrow all that we know and do, and reinvent the world to make it possible for future generations to go on, survive, enjoy material benefits, and protect the world that is all we have and can pass on. Go mining and other engineering.

Texts for construction engineers

Job Description of a Construction Engineer

Construction engineers are key cogs to successfully completing a construction project. The projects that they work on might include designing a drainage and sewage system, constructing a building or developing railroads or roadways. Construction engineers often focus on a specific type of construction project. Some of these specialties are:

Building – commercial housing or business building

Electrical – electrical systems

Mechanical – plumbing, heating or air conditioning

Highway or Heavy – bridges, airports, highways or water waste

Construction engineers often use computers when producing and analyzing their designs for a project. Their job requires being able to put together a good team to complete a project. Construction engineers need to possess the proper knowledge of estimating, planning and controlling the costs associated with construction projects. They may have an engineering degree and some construction work experience, or they may obtain a bachelor's degree in construction engineering.

Construction engineers do a lot of their work from offices. They also work on location at job sites to visually inspect the work being performed. They usually work 40-hour weeks; however, some jobs require more time based on deadlines or design issues.

Job Duties of Construction Engineers

A construction engineer wears many hats when directing and assessing a project. They will survey the area where the job is to take place, paying special attention to environmental issues or government codes that need to be considered. Before a job starts, they might prepare reports on their findings and consult with others who have a hand in the project. Those parties might include environmental associations, government agencies and third-party construction companies. Construction engineers need to have a strong understanding of building codes, laws and regulations that might affect their projects.

They must estimate and determine the total cost of a project. The associated costs can include:

- Site inspections
- Tests regarding sewage, drainage or elevation levels

- Materials
- Equipment
- Labor costs

Construction engineers manage a variety of parties involved in any given job. They are also responsible for supervising a job to its completion while paying special attention to the allotted budget for the project as a whole. They must have good communication, interpersonal and leadership skills. They should be able to pay meticulous attention to detail. Construction engineers should also have strong analytical, math and problem solving skills.

Career Outlook for Construction Engineers

The job sector of civil engineering as a whole, which included construction engineers, was expected to see a growth of 20% from 2012-2022 (*www.bls.gov*). Engineering remains one of the highest-paying industries for college graduates. As of May 2014, civil engineers earned an average wage of $87,130 per year.

Construction engineers can work in a variety of areas within the construction industry, including contracting and design. Management training can lead to positions as a cost engineer, a project superintendent, an operations manager or a safety and design engineer.

Careers in Construction Engineering

Construction engineers usually focus on a certain type of construction project. With a major in construction engineering, you'll be prepared for work in any of the following types of projects.

Building: These construction engineers usually focus on commercial building construction − houses or business buildings.

Heavy / Highway: These construction engineers manage highway, bridge, airport, water and wastewater treatment plant projects. The work can be in remote locations. Much of the work is excavation and underground work so the curriculum emphasizes geology and soil mechanics.

Mechanical: You can manage the installation of heating, ventilation, air conditioning, and plumbing systems. Many of the mechanical projects on buildings are construction projects in their own right. Mechanical contractors often do their own design on smaller projects.

Electrical: Electrical construction engineers manage the construction of electrical systems. You'll take the same circuits courses as electrical engineers but also learn about the construction side of the business.

Construction Engineers Career Track Positions

Vice President / Operations Manager manages staff of senior project managers, project managers and superintendents. Responsible for financial profitability of construction operations. May be involved in marketing and business development and client relationships.

Senior Project Manager/Project Manager is responsible for total project performance: cost budgets, project schedules, contract with clients, contracts with subcontractors, bidding and awarding subcontracts and purchase orders. Manages staff of superintendent, project engineers, office engineers, assistant project engineers, field engineers and support staff for each project.

A project manager is the main contact person with each client and the designers (architects and engineers). He/she has overall responsibility for the project safety plan, profits, quality and schedule. Position leads typically to senior project manager, then to project executive and possibly to an officer's position such as vice president or operations manager as his / her career develops.

A superintendent is responsible for day-to-day scheduling and supervision of all construction operations on the project. This person monitors quality of construction, enforcement of all safety policies and performance of subcontractors. He / she provides support to the project manager as required.

A project engineer is an entry level position reporting to the project manager. He / she assists project manager and superintendent as required. Responsibilities increase with experience starting with shop drawings, requests for information, document control and field operations support to the superintendent. Position typically involves a career track that includes construction cost estimating and construction site field engineering.

What is Construction & Engineering Management?

The Construction Engineering and Management (CEM) program develops knowledge, tools, and methods that can add value to construction projects and organizations with a focus on risk management. In mature industries such as construction successfully managing risk largely determines the success or failure of development projects and enterprises. By developing basic risk management skills and participating in leading edge research students can position themselves to make enormous differences in for-profit, government, and non-profit development organizations. Understanding the nature and structure of development risk provides a foundation for modeling, quantifying, and mitigating those risks.

Texts for environmental engineers

What Is an Environmental Engineer?

Environmental engineering is the branch of engineering that focuses on protecting the environment by reducing waste and pollution. The field is also dedicated to improving environmental conditions through remediation. It deals with the design of technologies and processes that control pollution releases and clean up existing contamination.

Environmental engineers design, plan, and implement measures to prevent, control, or remediate environmental hazards. They may work on waste treatment, wastewater treatment, site remediation, or pollution control technology.

Our environmental laws would mean little without professionals like these who know how to implement them at the facility level. These valuable professionals help control pollution, and design new technologies to engineer a better world.

What Does an Environmental Engineer Do?

Environmental engineers use their scientific knowledge to design systems that control pollution and protect public health. For example, they design systems, processes, and equipment to control waste and pollution, such as stack scrubbers and wastewater management systems. This includes industrial wastewater. Environmental engineers coordinate waste management and recycling activities at manufacturing sites and mines. They make sure it's treated and disposed of in accordance with all environmental and health regulations. In fact, they're often appointed to ensure that all of their companies' projects, including building and development projects, are compliant with regulations. They advise on the environmental effects of construction projects, fill out permit paperwork, incorporate regulations into project planning, and conduct inspections to ensure compliance. They write environmental investigation reports detailing their findings. Environmental engineers also frequently serve as a company's liaison with federal, state, or local agencies on issues related to waste program requirements.

In addition to controlling pollution, environmental engineers also design systems, processes, and equipment to help clean it up. The systems they create restore air, soil, and water quality at sites that have already been contaminated. Some environmental engineers work at the front lines of the clean energy economy, developing systems that convert waste into electric power.

Environmental engineers are often tasked with coordinating their companies' environmental management system (EMS). An EMS is a voluntary management technique that ensures systematic implementation and review of customized environmental and safety best practices. EMS following the international standard ISO 14001 are particularly beneficial to the credibility of companies involved in international activities.

Where Does an Environmental Engineer Work?

As of 2012, the greatest number of environmental engineers (28 %) worked in architectural, engineering, and related services. Another 21 % were employed in management, scientific, and technical consulting services. 13 % worked in state government, 7 % in federal government, and 6 % in local government.

Environmental engineers work in various settings. They usually work from in offices while planning designs or working on environmental permitting and regulatory issues. However, they may work at industrial sites or outdoors while conducting inspections or coordinating a facility's waste management activities. Most environmental engineers work full time. Those who manage projects often work overtime to monitor progress and meet deadlines.

Environmental Engineering Jobs

Environmental engineers integrate environmental science and engineering principles in order to improve and manage the natural environment. As our world population grows, environmental engineers strive to ensure that we all have a good quality of live while also accessing healthy water, air, and land for humans and other organisms. While jobs do vary from place to place, the standard scope of responsibility for an environmental engineer job looks like:

Assess industrial, commercial and residential sites for their environmental impact

Calibrating equipment used for air, water, or soil sampling

Design systems for waste management, reclamation, transfer and disposal on land, sea, and air

Advocate best remediative procedures for site clean-up and contamination

Advise policymakers and companies on relevant issues

Evaluate the current system performance and incorporate innovations or develop new technologies to enhance environmental protection

Collecting field samples and observations for data and observations

Investigating environmentally related complaints, recording data and compiling a report based on these

Establish waste-treatment and pollution-control plans

Design sampling guidelines for manufacturing and industrial stakeholders

Ensure that stakeholders are in regulatory compliance for waste management and disposal

Collect, construct and evaluate environmental impact statements

A senior environmental engineer has a breadth of experience that assures competent in a team-lead position. Many of the additional tasks at the upper tier may be administrative or managerial in scope, such as:

Creating reports, data meta-analysis and thought leadership

Communicating with a variety of technical and non-technical stakeholders

Navigating environmental regulations and funding sources

Liaising with interdisciplinary teams for an holistic solution to environmental engineering problems

What Is the Job Demand for Environmental Engineering?

The employment outlook for environmental engineers is excellent. The field is projected to grow 15 % from 2012 to 2022, which is faster than the average for all occupations. Some growth will be fueled by the need for water reclamation projects that increase water supplies, especially in Western states. Concerns about industrial wastewater, particularly from fracking for natural gas, will also drive growth in this area. Retirements will also open up future positions. Those with master's degrees will have the best opportunities to fill vacancies.

Texts for construction and transport engineers

What is transport engineering?

Transport engineers plan, design and operate the large public and private infrastructure systems that connect our physical world.

We need a broad range of continually evolving, large-scale transport infrastructure, including road, rail, air and water. Transport engineers quantify and optimise our mobility infrastructure networks to meet travel and freight demands, while ensuring safety, equity and sustainability, at minimal levels of congestion and cost.

Transport engineering has always been one of the essential civil engineering disciplines, impacting roadways, bridges, transit stations, airports and sea ports etc. Transport engineering has now developed into a multidisciplinary field spanning economics, politics, sociology and psychology, in addition to its core mathematical, engineering and computational principles.

Transport planning involves developing mathematical techniques for:

forecasting travel demand and planning to accommodate growth in demand

determining improvements to the transport infrastructure

reducing emissions

reducing energy use.

Computational transport planning uses mathematical methods to predict, represent and quantify:

the evolution of land use in cities

travel attributes such as trip purpose

travel decisions, including mode choice.

Planning models then examine the feasibility of projects and policies through cost-benefit and scenario analysis.

Transport engineers face multi-faceted design decisions when they are designing optimised transport infrastructure networks. These might relate to:

the physical expansion of transport facilities, such as lane width or the number of lanes, for a roadway

the materials and thickness used in pavements

the geometry of a facility, such as a roadway, rail line or airport

road pricing schemes

deploying information-based technology.

In all design decisions, multiple performance measures, cost metrics and safety criteria must be considered and weighed.

Transport operations, whether for road, rail, port or air traffic, are designed to minimise travel delays, improve safety, reduce emissions and enhance reliability, as well as taking other considerations into account.

Transport operation decisions involve:

optimising traffic signals

setting specific tolls

designing traffic signs and markings.

With the development of new Intelligent Transportation Systems (ITS), transport engineers use tools including advanced traveller information systems (such as variable message signs), advanced traffic control systems (such as ramp meters) and vehicle-to-vehicle (V2V) communications to optimise the performance of the transport system.

Transportation Engineer

There are dozens of fields that fall into the category of transportation, including all facets of trains, buses, ships, airplanes, subways, or cars. A Transportation Engineer researches, designs, implements, and maintains the roads, ports, airports, and bus systems that the rest of us rely on. The first step with each project for a Transportation Engineer is to predict the amount of use it will receive. If you are designing a new high-speed commuter train, for example, you need...

Transportation engineering or transport engineering is the application of technology and scientific principles to the planning, functional design, operation and management of facilities for any mode of transportation in order to provide for the safe, efficient, rapid, comfortable, convenient, economical, and environmentally compatible movement of people and goods (transport). It is a sub-discipline of civil engineering [1] and of industrial engineering. Transportation engineering is a major component of the civil engineering and mechanical engineering disciplines, according to specialisation of academic courses and main competences of the involved territory. The importance of transportation engineering within the civil and industrial engineering profession can be judged by the number of divisions in ASCE (American Society of Civil Engineers) that are directly related to transportation.

There are six such divisions (Aerospace; Air Transportation; Highway; Pipeline; Waterway, Port, Coastal and Ocean; and Urban Transportation) representing one-third of the total 18 technical divisions within the ASCE (1987).

The planning aspects of transportation engineering relate to urban planning, and involve technical forecasting decisions and political factors. Technical forecasting of passenger travel usually involves an urban transportation planning model, requiring the estimation of trip generation (how many trips for what purpose), trip distribution (destination choice, where is the traveler going), mode choice (what mode is being taken), and route assignment (which streets or routes are being used). More sophisticated forecasting can include other aspects of traveler decisions, including auto ownership, trip chaining (the decision to link individual trips together in a tour) and the choice of residential or business location (known as land use forecasting). Passenger trips are the focus of transportation engineering because they often represent the peak of demand on any transportation system.

A review of descriptions of the scope of various committees indicates that while facility planning and design continue to be the core of the transportation engineering field, such areas as operations planning, logistics, network analysis, financing, and policy analysis are also important to civil engineers, particularly to those working in highway and urban transportation. The National Council of Examiners for Engineering and Surveying (NCEES) list online the safety protocols, geometric design requirements, and signal timing.

Transportation engineering, as practiced by civil engineers, primarily involves planning, design, construction, maintenance, and operation of transportation facilities. The facilities support air, highway, railroad, pipeline, water, and even space transportation. The design aspects of transportation engineering include the sizing of transportation facilities (how many lanes or how much capacity the facility has), determining the materials and thickness used in pavement designing the geometry (vertical and horizontal alignment) of the roadway (or track).

Before any planning occurs the Engineer must take what is known as an inventory of the area or if it is appropriate, the previous system in place. This inventory or database must include information on population, land use, economic activity, transportation facilities and services, travel patterns and volumes, laws and ordinances, regional financial resources, community values and expectations. These inventories help the engineer create business models to complete accurate forecasts of the future conditions of the system review.

Operations and management involve traffic engineering, so that vehicles move smoothly on the road or track. Older techniques include signs, signals, markings, and tolling. Newer technologies involve intelligent transportation systems, including advanced traveler information systems (such as variable message signs), advanced traffic control systems (such as ramp meters), and vehicle infrastructure integration. Human factors are an aspect of transportation engineering, particularly concerning driver-vehicle interface and user interface of road signs, signals, and markings.

Texts for civil engineers

Civil engineering is one of the oldest professions. As far back as the Great Pyramids at Giza, brilliant engineering minds have been thinking up ways to design and build mind-blowing structures. Today, the only thing that has changed is what they create. With new, lighter and stronger materials to work with, and greater challenges to be met, there is no limit to what civil engineers can achieve. They build towers, bridges, roads, railways and tunnels; airports and mines; dams, ports and harbours; water supplies and sewerage schemes; and irrigation systems and flood mitigation works. In fact, any infrastructure that's required to run our modern society needs the input of civil engineers along the way. The profession is very broad, with opportunities for a specialised career, including:

construction engineers and managers
geotechnical engineers
structural engineers
transport engineers
water engineers
civil engineers with architecture

Construction engineers and managers, engineering managers, project managers and asset managers are responsible for essentially all decision making regarding expenditure related to infrastructure.

The work is extremely motivating and rewarding as construction engineers see infrastructure unfolding from nothing to become completed assets, such as bridges and buildings, which will serve society for many years.

Construction projects can be extremely large, as in the oil and gas industries; medium, as in building bridges; or small, as in small commercial office and residential construction. Construction engineers can work in large teams or medium-sized teams in the public or private sector, or be sole practitioners. They are able to choose the type of work that suits their interests, often moving on to senior business roles in construction companies.

Construction engineering and management skills are internationally recognised.

What do construction engineers do?

Construction engineers must understand relevant construction technology, as well as having managerial skills, such as costing, contracts, planning and risk. Construction engineers are problem solvers and innovators. They typically work in offices located wherever the construction is taking place, in cities, regional towns and overseas.

Infrastructure projects may take several years to complete and when they are finished, construction engineers can transfer to another project, while progressing their careers, or they might remain with the project as a project or asset manager or, more generally, as engineering managers. Their skill set includes financial and economic appraisal and managing life cycle costs, risk, people, contracts and planning.

Construction engineering and management is crucial in providing the infrastructure on which society depends.

Geotechnical engineers deal with many types of infrastructure – tunnels, bridges, dams, buildings, roads, railways, ports and landfills – that are built on or in the ground.

Geotechnical engineers have to produce designs for infrastructure that are safe and serve the required purpose – during the construction phase, as well as a long time into the future.

Geotechnical engineers gather the information needed for their designs and analyses from site investigations which can be in urban areas or remote areas, depending on where the infrastructure has to be built.

Geotechnical engineers also study landslides and earthquakes, and ways of preventing future landslides from occurring and ways of making infrastructure earthquake resistant.

Geotechnical engineers tend to be practical people who are good at using mathematics and mechanics and who enjoy working outside, as well as in an office environment.

Structural engineers use their creativity and scientific training to develop and maintain new and existing structures and incorporate advanced materials.

Structural engineers:

develop structural solutions to resist loads and other forces

devise ways to provide safe load paths for these forces.

Designing a society's infrastructure presents enormous challenges, creatively and intellectually. This is a fascinating career for those interested in building, mechanics and mathematics and who would enjoy working in teams with other engineering disciplines, architects, contractors and builders.

Transport engineers apply their maths skills and interests in strategic planning and decision making to provide innovate engineering solutions for problems that affect people in their daily lives.

Transport engineers work in government departments and organisations, planning agencies, private firms and financial institutes – providing technical and managerial support to a wide diversity of transport projects.

To safeguard Australia's water future, water engineers need a long-term and holistic perspective of water from catchment to ocean and innovative approaches to all aspects of the water cycle.

Texts for software engineers

What is Software Engineering?

The engineering field has taken on many new disciplines as our scientific knowledge has grown. The latest discipline is software engineering. According to the Institute of Electrical and Electronics Engineers (IEEE), software engineering means applying the principles of engineering to the software development field. Software engineering differs from other branches of engineering in that professionals are building an intangible structure and not a tangible one. Since software is embedded in the machines used in various industries, though, malfunctioning software can actually have tangible effects. With software used in everything from medical equipment to airplanes, the end result of faulty software can indeed be loss of life.

Even non-embedded software impacts many areas of our lives. We routinely trust software with our financial information and passwords. We use it to run our businesses and conduct our work activities. Yet it’s far from foolproof. There may be hackers or system overloads. Then there are the times that the software works from a technical standpoint, but fail to give a good user experience. Too often, routine software is designed from a “code and fix” model when sounder principles at the front end would alleviate problems. Here, too, it’s important to have a thorough grasp of the purpose of the structure and of the many things that structure may be called upon to withstand.

Software engineering often does involve writing code, but this is only one stage in the process. True software engineering has a well-articulated life cycle.

When software projects require engineering, the process begins long before the product is designed – and it continues long afterward. It begins with a thorough study of the software requirements. Some requirements involve the functions the program needs to carry out. The program may, for example, need to verify that a user is authorized to access it. Other requirements involve constraints, for example, systems already in place.

The next stage is software design. This involves creating algorithms, or instructions for the computer. The actual coding process may be completed by software engineers, who have comprehensive training, or by programmers who are versed only in coding. Later comes validation and maintenance. Stages don't necessarily proceed in a linear manner; they may be organized in a variety of ways, including spiraling.

What Types of Software Require Engineering?

A systematic and disciplined approach isn't necessary for every endeavor. You don't need engineering training to design a simple game or a program that teaches your child to read. You do need it, though, to create high stakes software for the defense department.

Businesses also employ software engineers to create customized software and address vulnerabilities before they happen. This makes sense when we think of the complexity of the tasks that the average professional carries out, tasks like holding meetings in real time with collaborators oceans away. Even when engineering principles aren't necessary for safety, sound design can increase efficiency and decrease costs.

You'll find a diverse group of employers advertising for true software engineers. Disney Interactive Media is among the companies seeking software developers who are familiar with the software development life cycle.

Education and Job Prospects for Software Engineers

There are two main branches of software engineering. Applications software engineers create and maintain computer applications. Systems software engineers analyze technical needs department by department and create or maintain appropriate systems. Setting up and maintaining intranet systems would fall under their scope.

Software engineers typically hold at least a baccalaureate degree. A master's is necessary for some positions. The focus is on acquiring a core of software development knowledge that will remain relatively stable across a span of years, even as new languages are developed and others go out of favor.

Software engineering is a growing field, even during difficult economic times. The Bureau of Labor Statistics reports that while employers may outsource some positions, outsourcing is less likely to occur in highly specialized computer and software engineering positions than in lower level programming positions. There are exciting opportunities for those with an educational background in software engineering, computer science, software development, computer engineering and similar disciplines. Check out some of the potential career paths.

Software Engineering

Software engineering (SE) is concerned with developing and maintaining software systems that behave reliably and efficiently, are affordable to develop and maintain, and satisfy all the requirements that customers have defined for them. It is important because of the impact of large, expensive software systems and the role of software in safety-critical applications. It integrates significant mathematics, computer science and practices whose origins are in engineering.

Students can find software engineering in two contexts: computer science programs offering one or more software engineering courses as elements of the CS curriculum, and in separate software engineering programs. Degree programs in computer science and in software engineering tend to have many courses in common; however, as of Spring 2006 there are few SE programs at the bachelor's level. Software engineering focuses on software development and goes beyond programming to include such things as eliciting customers' requirements, and designing and testing software. SE students learn how to assess customer needs and develop usable software that meets those needs.

Both computer science and software engineering curricula typically require a foundation in programming fundamentals and basic computer science theory. They diverge in their focus beyond these core elements. Computer science programs tend to keep the core small and then expect students to choose among more advanced courses (such as systems, networking, database, artificial intelligence, theory, etc.). In contrast, SE programs generally expect students to focus on a range of topics that are essential to the SE agenda (problem modeling and analysis, software design, software verification and validation, software quality, software process, software management, etc.). While both CS and SE programs typically require students to experience team project activity, SE programs tend to involve the students in significantly more of it, as effective team processes are essential to effective SE practices. In addition, a key requirement specified by the SE curriculum guidelines is that SE students should learn how to build software that is genuinely useful and usable by the customer and satisfies all the requirements defined for it.

Most people who now function in the U.S. as serious software engineers have degrees in computer science, not in software engineering. In large part this is because computer degrees have been widely available for more than 30 years and software engineering degrees have not. Positions that require development of large software systems often list “Software Engineer” as the position title. Graduates of computer science, computer engineering, and software engineering programs are good candidates for those positions, with the amount of software engineering study in the programs determining the suitability of that graduate for such a position.

Most IT professionals who have computing degrees come from CS or IS programs. It is far too soon for someone who wants to work as a software engineer or as an information technology practitioner to be afraid that they won’t have a chance if they don’t graduate from a degree program in one of the new disciplines. In general, a CS degree from a respected program is the most flexible of degrees and can open doors into the professional worlds of CS, SE, IT, and sometimes CE. A degree from a respected IS program allows entry to both IS and IT careers.

Media attention to outsourcing, offshoring, and job migration has caused many to be concerned about the future of computing-related careers. It is beyond the scope of this web site to address these issues. The report of the British Computer Society addresses these issues as they impact the U.K. The Globalization Report of the ACM Job Migration Task Force reflects an international perspective, not just a U.S-centric one.

Computer Science

Computer science (CS) spans the range from theory through programming to cutting-edge development of computing solutions. Computer science offers a foundation that permits graduates to adapt to new technologies and new ideas. The work of computer scientists falls into three categories: a) designing and building software; b) developing effective ways to solve computing problems, such as storing information in databases, sending data over networks or providing new approaches to security problems; and c) devising new and better ways of using computers and addressing particular challenges in areas such as robotics, computer vision, or digital forensics (although these specializations are not available in all computer science programs). Most computer science programs require some mathematical background.

Let us consider what is involved in a career path in each area.

Career Path 1: Designing and implementing software. This refers to the work of software development which has grown to include aspects of web development, interface design, security issues, mobile computing, and so on. This is the career path that the majority of computer science graduates follow. While a bachelor's degree is generally sufficient for entry into this kind of career, many software professionals return to school to obtain a terminal master's degree. (Rarely is a doctorate involved.) Career opportunities occur in a wide variety of settings including large or small software companies, large or small computer services companies, and large organizations of all kinds (industry, government, banking, healthcare, etc.). Degree programs in software engineering also educate students for this career path.

Career Path 2: Devising new ways to use computers. This refers to innovation in the application of computer technology. A career path in this area can involve advanced graduate work, followed by a position in a research university or industrial research and development laboratory; it can involve entrepreneurial activity such as was evident during the dot-com boom of the 1990s; or it can involve a combination of the two.

Career Path 3: Developing effective ways to solve computing problems. This refers to the application or development of computer science theory and knowledge of algorithms to ensure the best possible solutions for computationally intensive problems. As a practical matter, a career path in the development of new computer science theory typically requires graduate work to the Ph.D. level, followed by a position in a research university or an industrial research and development laboratory.

Career Path 4: Planning and managing organizational technology infrastructure. This is the type of work for which the new information technology (IT) programs explicitly aim to educate students.

Career paths 2 and 3 are undenably in the domain of computer science graduates. Career paths 1 and 4 have spawned the new majors in software engineering and information technology, respectively, and information systems graduates often follow Career path 1, too. Computer scientists continue to fill these positions, but programs in software engineering, information technology, and information systems offer alternative paths to these careers.

Information Systems

Information systems (IS) is concerned with the information that computer systems can provide to aid a company, non-profit or governmental organization in defining and achieving its goals. It is also concerned with the processes that an enterprise can implement and improve using information technology. IS professionals must understand both technical and organizational factors, and must be able to help an organization determine how information and technology-enabled business processes can provide a foundation for superior organizational performance. They serve as a bridge between the technical and management communities within an organization.

What information does the enterprise need? How is that information generated? Is it delivered to the people who need it? Is it presented to them in ways that permit them to use it readily? Is the organization structured to be able to use technology effectively? Are the business processes of the organization well designed? Do they use the opportunities created by information technology fully? Does the organization use the communication and collaboration capabilities of information technologies appropriately? Is the organization capable of adapting quickly enough to changing external circumstances? These are the important issues that businesses rely on IS people to address.

A majority of IS programs are located in business schools; however, they may have different names such as management information systems, computer information systems, or business information systems. All IS degrees combine business and computing topics, but the emphasis between technical and organizational issues varies among programs. For example, programs differ substantially in the amount of programming required.

Traditionally, many graduates of IS programs have functioned in roles that are similar to the roles for which IT programs explicitly prepare their students. Information systems graduates continue to fill these roles, but the new programs in information technology offer an alternative path to these positions.

Information Technology

Information technology (IT) is a label that has two meanings. In common usage, the term “information technology” is often used to refer to all of computing. As a name of an undergraduate degree program, it refers to the preparation of students to meet the computer technology needs of business, government, healthcare, schools, and other kinds of organizations.

IT professionals possess the right combination of knowledge and practical, hands-on expertise to take care of both an organization’s information technology infrastructure and the people who use it. They assume responsibility for selecting hardware and software products appropriate for an organization. They integrate those products with organizational needs and infrastructure, and install, customize and maintain those applications, thereby providing a secure and effective environment that supports the activities of the organization’s computer users. In IT, programming often involves writing short programs that typically connect existing components (scripting).

Planning and managing an organization’s IT infrastructure is a difficult and complex job that requires a solid foundation in applied computing as well as management and people skills. Those in the IT discipline require special skills – in understanding, for example, how networked systems are composed and structured, and what their strengths and weaknesses are. There are important software systems concerns such as reliability, security, usability, and effectiveness and efficiency for their intended purpose; all of these concerns are vital. These topics are difficult and intellectually demanding.

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Mixed Disciplinary Majors

Because computing is such an important and dynamic field, many interdisciplinary majors, some very recent developments, exist at some schools. Here are are just a few examples of these opportunities. Some of these programs are offered at a number of U.S. schools as of Spring 2006; some only at a handful of U.S. schools.

Bioinformatics combines elements from at least biology, biochemistry, and computer science, and prepares students for careers in the biotechnology and pharmaceutical industries, or for graduate school in informatics. Some programs may also include elements from information systems, chemistry, mathematics, and statistics.

Computational science means science done computationally, and serves as a bridge between computing technology and basic sciences. It blends several fields including computer science, applied mathematics, and one or more application sciences (such as physics, chemistry, biology, engineering, earth sciences, business and others). Some programs also include information systems.

Computer Science and Mathematics combines computer science with mathematics of course. Some of these programs are found at schools that do not have a full major in computer science; some are found at universities with very large computer science departments.

Gaming and Animation. Majors for students interested in creating computer games and computer animations are being developed at a number of schools. These majors have various flavors and may combine either or both of computer science and information technology work with either or both of art and (digital) media studies.

Medical (or health) informatics programs are for students interested in students who want to work in a medical environment. Some students will work as technology experts for hospitals; some in public health; some students may be premed or pre-dental. Coursework may be drawn from any or all of computer science, information systems, or information technology in combination with biology, chemistry, and courses unique to this interdisciplinary field.

Be aware that especially in the newer interdisciplinary areas, different schools use different names for the same subject. For example, one school's "bioinformatics" may be another school's "computational biology."

Texts for managers and economic engineers

Engineering Management is a specialized form of management that is concerned with the application of engineering principles to business practice. Engineering management is a career that brings together the technological problem-solving savvy of engineering and the organizational, administrative, and planning abilities of management in order to oversee complex enterprises from conception to completion.[1] A Master of Science in Engineering Management (MSEM, or MS in Engineering Management) is sometimes compared to a Master of Business Administration (MBA) for professionals seeking a graduate degree as a qualifying credential for a career in engineering management.

Example areas of engineering are product development, manufacturing, construction, design engineering, industrial engineering, technology, production, or any other field that employs personnel who perform an engineering function.

Successful engineering managers typically require training and experience in business and engineering. Technically inept managers tend to be deprived of support by their technical team, and non-commercial managers tend to lack commercial acumen to deliver in a market economy. Largely, engineering managers manage engineers who are driven by non-entrepreneurial thinking, and thus require the necessary people skills to coach, mentor and motivate technical professionals. Engineering professionals joining manufacturing companies sometimes become engineering managers by default after a period of time. They are required to learn how to manage once they are on the job, though this is usually an ineffective way to develop managerial abilities.

What Does A Manager Do?

One of the first lessons a beginning manager must learn is that good managers don't Do anything. A manager's role is to manage, the people who do actually, do the work. The manager's role is to make the group more effective than they would be without him/her.

That doesn't mean that managers spend all day sitting around with their feet up on the desk drinking coffee. Most managers I know work very hard and work longer hours than anyone on their teams.

One of the first things you have to do as a manager is to build your team. Usually, when you become a manager, your team is already in place. You may need to add a few people or replace some people. Don't be in a hurry. Learn about your team and the people on the team before you shake things up.

Don't feel you have to prove you're the manager. Take the time to think things through before you make major changes.

The simplest way to make your team more productive is to motivate them. Motivating people can be a real challenge for many managers because it is so different for each person. You will find that what works to motivate one person won't work for another and will actually be a demotivator for still another. As a manager, you need to find the unique motivators for each member of your team.

While you are motivating your team, you have to stay focused on the business itself. Managers must handle many specific tasks, mostly related to personnel actions and financial transactions, to keep the company functioning. You will have to make decisions daily about the correct way to do things and to keep your team function as a part of the whole company. It doesn't matter how well your unit performs unless it is in sync with the rest of the company.

Things go wrong every day. Things change constantly. Managers play a key role in figuring out what is going wrong and doing what is needed to fix it.

In addition to managing your team, your role as a manager requires that you also manage the organization above your unit. Your job includes buffering your people from the company power structure. Your boss, and any bosses above him / her, need to go through you and not directly to your team.

In additon to managing upward, you need to work well with your peers. Your team will not function well if they have problems with other departments. You can help them be more effective if you can establish good working relationships with your peers, the heads of the other departments your team needs to work with.

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5 Things the best managers do and don't do

Excellent managers come in all shapes and sizes. They can be loud and quiet, extroverted or introverted, Type A or calm. Their management style can be as unique as personalities. But while elements of personal style may vary, there are absolutes one can point to about management substance. Accordingly, here are 5 things the best managers do – and don’t do.

Keep the big picture in mind – They have a sound strategic mindset. They know their company’s business well, and ensure that the activities of their unit or department or division are always firmly aligned with broader initiatives and strategies.

Are consistent in their behavior – People like and need predictability. I never minded working for someone who was tough, so long as he or she was predictably tough. Thus, you knew what to expect and count on in terms of behavior and expectations. Problems arise for employees when a manager is erratic – for example, lenient and upbeat one day, and controlling and dour the next.

Treat their employees’ time as if it’s as important as their own – The best managers earn respect by being every bit as prompt with their own employees as they are, for example, with their own boss. It shows you value your employees as individuals – a feeling that in all likelihood will be mutual.

Are unafraid to question their own management – In a thoughtful, respectful way, of course. As one colleague I used to work with put it: “If you’re just paying me to say what you want to hear – and not for my own opinions – then you’re paying me too much.” I’m not advocating cantankerous, difficult behavior – just independent, honest thoughts when needed.

Earn the trust of those they manage − The best managers are credible and always true to their word. In short, trustworthy.

On the other side of this equation, the best managers don’t:

Become intoxicated by positional power − A little power goes a long way; it’s easy to abuse. When too many people are too eager to please you, it’s tempting to take advantage of that. The best managers realize that positional power is a privilege, and wield it judiciously.

Play favorites – As obvious in theory as this point may seem … most managers will readily admit it’s simply human nature to enjoy working with some employees more than others. Some people are just more naturally likable; some always have a great attitude, while others equally talented may not have the same charm or charisma. But any natural tendencies toward favoritism should be resisted; it's not only unfair – it's a quick way to lose, or at least damage, the respect of your team.

Go off half cocked – The best management decisions are rational and logical, not emotional. The daily frustrations of the job can easily lead one to impulsive decisions – they can even be cathartic (you're fired!) – but hasty, angry decisions are rarely optimal for an organization.

Avoid conflict – Since a good amount of management involves addressing or adjudicating conflict situations, management is no place for conflict-avoiders. Resolving all types of conflict diplomatically and effectively is an integral part of the job, a core managerial skill.

Feel threatened by the abilities of their employees – The best managers are secure, and want to build a team of talented people whom they continue to develop. No less a business person than Warren Buffett is well known for wanting to be surrounded by "the brightest and most productive people" he can find. Based on my own modest experience, I couldn't agree more. Since management is all about accomplishing things through others … the better people you have, the higher quality work your team or organization will produce.

Net-net, there's no single roadmap for effective management; there are innumerable ways to accomplish what needs to be done. That having been said (and this list is by no means exhaustive), there are different roads to travel to get where you need to go, and some roads are smoother and more direct than others.

10 key activities you need to master as manager

Manager at the company I advise recently asked me a question, the answer to which should be obvious but it is mostly not at all. At the time we were discussing first what he should not do as a manager and what kind of activities do not bring desired results – from business, from employee and from management perspective. Shortly after we finished our discussions, he said that we did discuss, what he should not do, but he would like to know not only what he should not do, but even more so what he should do as a manager.

I believe that his question is spot on and is rarely answered in simple and easy to understand manner. You can find tons of content regarding management all over the internet and in various books, but it is rarely right to the point and is almost never easy to understand or implement – it is also usually focused only on specific aspect of management, rather than on management of company in general. To better prepare myself to answer him in connection with his specific situation – in connection with his company and their processes – I decided to put together a short list of 10 key assignments that manager has to master – together with a few practical tips and tricks on how to do it. Therefore, here it goes … The list of key assignments you have to perform as a manager is comprised of the following:

Know your customers – successful companies are always oriented towards their customers and you as the manager should be also – if you know your customers, you can adapt your products and services accordingly and lead your company towards success; practical tip 1: take every chance you get to talk to your customers and ask them questions about your services and listen to them (don't try to persuade them that your services or products are the best, just listen to them closely), think about your customers – about who they are and why they use your services and products, last but not least, find out who your customers are in terms of a demographic profile (or in case of business customers, in terms of company profile) – you can find this out by conducting appropriate research among your customers or by noting your customer's profile prior and in the middle of your business relationship with your customer.

Know your products and services – if you want to manage your company successfully, you have to know what your company does – what kind of products it makes and sells and what kind of services it offers – if you don't know your products and services well enough, you will not be able to lead your company successfully; practical tip 2: use services and products of your company as if you are the customer, real ordinary customer and not VIP customer – go also through all the procedures that customers need to go through – keep in mind that you do not need to be an expert regarding your products and services, but you should still know them in enough detail (and from customer perspective).

Know your company and its processes – in order to be able ti improve anything in your company, you need to be familiar with organizational structure of the company (formal and informal) and with its processes (actual processes, not only written processes); practical tip 3: review everything you can find written about your company's organizational structure and its processes – then talk to your employees, first to managers of individual departments and if necessary afterwards to individual employees from specific departments – take enough time to get to know the company and its processes well enough, otherwise you will not be able to manage successfully any changes that need to be implemented in the company, because you will not know and understand your starting point

Prepare your business plan – you need to establish your company's position at this moment (your starting point), where you want the company to be in 1 month or in 1 year or in 3 years (or more) and how is your company going to get there – this helps you get the big picture and concentrate on those activities that bring you and your company best results; practical tip 4: use the term business plan loosely – you don't need to write a lengthy document for it, instead opt for business model canvas or any similar method – just make sure you have clear overview of where you are currently, where you want to be in the future and how are you going to get there – and if you got to know your customers, your offering and your company well enough, you will be able to prepare the business plan with little effort.

Monitor and control – one of key aspects of being a manager is the fact, that you need to know, where you, your colleagues and your company are at any point in time – if you know your position, you can act accordingly, if you don't you will make wrong decisions; practical tip 5: do make sure that your controlling function in the company is providing your with timely and relevant information – define what kind of reports do you want to receive (what kind of data, comparisons between plans and budget and realization etc.) and how often do you want to receive them – please, keep in mind that too many reports will obstruct your ability to see your general company's position and will also drain your company's resources (be reasonable with what you wish to receive)

Decide and act – the key assignment that you took with your management position are decisions – this is also the main decision between top management and others – the higher you are, the more you need to decide; practical tip 6: don't try to stall your decision and stay undecided for too long – keep in my mind that you can always take the decision to keep status quo for certain period of time and review your decision again after that time – the difference between not deciding and deciding to change nothing at the moment is huge – with the latter you know, where you stand, while with not deciding you leave everything to chance

Inform – always make sure you explain reasoning behind your decisions and actions – your colleagues will appreciate it, because they will know and understand why certain decisions are being taken and will accept them more easily; practical tip 7: share as much information as possible with employees – let them know company's business results, its current standing and current goings-on in the company – people like to know where they stand and will usually surprise you with increased motivation, improvements and adjustments of their work and actions

Manage people – companies exist because they enable people to work together towards common goals more efficiently than if they would be on their own – without people, there would be no companies; practical tip 8: make sure your decisions are constant and transparent and your colleagues are sufficiently informed (rather more than too little) – and your colleagues will generally be willing to follow your lead

Manage relationship with company's owners – lots of times relationship with owners tends to be overlooked, when speaking of what manager's tasks are – as a manager you need to make sure you are aligned with owners of the company, if you want to implement your plans and if you want to be successful; practical tip 9: owners of the company are not enemies – they are the ones, who sign off on your reward and they are people like yourself (or at least represented by people, if your company's owners are other companies) – therefore you need to make sure and invest enough time to build positive relationship with them

Keep focus – don't let yourself be consumed by tiny everyday operational issues – make sure you keep your focus on where do you want to take your company, otherwise you will not be able to successfully manage your company; practical tip 10: re-read your business plan at least once a month – it will enable you to set your current priorities properly and keep your focus and executing your business plan successfully

If you cover all of the above successfully, then you should be on your way towards becoming a solid manager. And you can then start to occupy yourself how to improve your management skills – the managing people and managing owners part of the list – and how to be a great manager …

Economists ‒ What They Do

Economists study how society distributes resources, such as land, labor, raw materials, and machinery, to produce goods and services. They conduct research, collect and analyze data, monitor economic trends, and develop forecasts on a wide variety of issues, including energy costs, inflation, interest rates, exchange rates, business cycles, taxes, and employment levels, among others.

Economists develop methods for obtaining the data they need. For example, sampling techniques may be used to conduct a survey, and various mathematical modeling techniques may be used to develop forecasts. Preparing reports, including tables and charts, on research results also is an important part of an economist's job, as is presenting economic and statistical concepts in a clear and meaningful way for those who do not have a background in economics. Some economists also perform economic analysis for the media.

Many economists specialize in a particular area of economics, although general knowledge of basic economic principles is essential. Microeconomists study the supply and demand decisions of individuals and firms, such as how profits can be maximized and the quantity of a good or service that consumers will demand at a certain price. Industrial economists and organizational economists study the market structure of particular industries in terms of the number of competitors within those industries and examine the market decisions of competitive firms and monopolies. These economists also may be concerned with antitrust policy and its impact on market structure. Macroeconomists study historical trends in the whole economy and forecast future trends in areas such as unemployment, inflation, economic growth, productivity, and investment. Monetary economists and financial economists do work that is similar to that done by macroeconomists. These workers study the money and banking system and the effects of changing interest rates. International economists study global financial markets, currencies and exchange rates, and the effects of various trade policies such as tariffs. Labor economists and demographic economists study the supply and demand for labor and the determination of wages. These economists also try to explain the reasons for unemployment and the effects of changing demographic trends, such as an aging population and increasing immigration, on labor markets. Public finance economists are involved primarily in studying the role of the government in the economy and the effects of tax cuts, budget deficits, and welfare policies. Econometricians investigate all areas of economics and apply mathematical techniques such as calculus, game theory, and regression analysis to their research. With these techniques, they formulate economic models that help explain economic relationships that can be used to develop forecasts about business cycles, the effects of a specific rate of inflation on the economy, the effects of tax legislation on unemployment levels, and other economic phenomena.

Many economists apply these areas of economics to health, education, agriculture, urban and regional economics, law, history, energy, the environment, and other issues. Economists working for corporations are involved primarily in microeconomic issues, such as forecasting consumer demand and sales of the firm's products. Some analyze their competitors' market share and advise their company on how to handle the competition. Others monitor legislation passed by Congress, such as environmental and worker safety regulations, and assess how new laws will affect the corporation. Corporations with many international branches or subsidiaries might employ economists to monitor the economic situations in countries where they do business or to provide a risk assessment of a country into which the company is considering expanding.

Economists working in economic consulting or research firms sometimes perform the same tasks as economists working for corporations. However, economists in consulting firms also perform much of the macroeconomic analysis and forecasting conducted in the United States. Their analyses and forecasts are frequently published in newspapers and journal articles.

Another large employer of economists is government. Economists in the Federal Government administer most of the surveys and collect the majority of the economic data about the United States. For example, economists in the U.S. Department of Commerce collect and analyze data on the production, distribution, and consumption of commodities produced in the United States, and economists employed by the U.S. Department of Labor collect and analyze data on the domestic economy, including data on prices, wages, employment, productivity, and safety and health.

Economists who work for government agencies also assess economic conditions in the United States and abroad to estimate the effects of specific changes in legislation and public policy. Government economists advise policy makers in areas such as the deregulation of industries, the effects of changes to Social Security, the effects of tax cuts on the budget deficit, and the effectiveness of imposing tariffs on imported goods. An economist working in State or local government might analyze data on the growth of school-age or prison populations and on employment and unemployment rates to project future spending needs.

Work Environment

Economists have structured work schedules. They often work alone, writing reports, preparing statistical charts, and using computers, but they also may be an integral part of a research team. Many work under pressure of deadlines and tight schedules, which may require overtime. Their routine may be interrupted by special requests for data and by the need to attend meetings or conferences. Some travel may be necessary.

Education & Training Required

A master's or Ph.D. degree in economics is required for many private sector economist jobs and for advancement to higher-level positions. In the Federal Government, candidates for entry-level economist positions must have a bachelor's degree with a minimum of 21 semester hours of economics and 3 hours of statistics, accounting, or calculus, or a combination of education and experience.

Economics includes numerous specialties at the graduate level, such as econometrics, international economics, and labor economics. Students should select graduate schools that are strong in the specialties that interest them. Some schools help graduate students find internships or part-time employment in government agencies, economic consulting or research firms, or financial institutions before graduation.

Undergraduate economics majors can choose from a variety of courses, ranging from microeconomics, macroeconomics, and econometrics to more philosophical courses, such as the history of economic thought. Because of the importance of quantitative skills to economists, courses in mathematics, statistics, econometrics, sampling theory and survey design, and computer science are extremely helpful.

Whether working in government, industry, research organizations, or consulting firms, economists with a bachelor's degree usually qualify for entry-level positions as a research assistant, for marketing or finance positions, or for various sales jobs. A master's degree usually is required to qualify for more responsible research and administrative positions. A Ph.D. is necessary for top economist positions in many organizations.

Aspiring economists should gain experience gathering and analyzing data, conducting interviews or surveys, and writing reports on their findings while in college. This experience can prove invaluable later in obtaining a full-time position in the field because much of the economist's work, especially in the beginning, may center on these duties. With experience, economists eventually are assigned their own research projects. Related job experience, such as work as a stock or bond trader, might be advantageous.

Other Skills Required (Other qualifications)

Those considering careers as economists should be able to pay attention to details because much time is spent on precise data analysis. Candidates also should have strong computer and quantitative skills and be able to perform complex research. Patience and persistence are necessary qualities, given that economists must spend long hours on independent study and problem solving. Good communication skills also are useful, as economists must be able to present their findings, both orally and in writing, in a clear, concise manner.

Список использованных источников

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http://www.livescience.com/47571-electrical-engineering.html
https://chbe.illinois.edu/undergraduate-program/prospective-students/admissions/what-chemical-engineering
http://www.aiche.org/community/students/career-resources-k-12-students-parents/what-do-chemical-engineers-do
http://www.wisegeek.com/what-is-engineering-economics.htm#
https://en.wikipedia.org/wiki/Mining_engineering
http://www.mining.com/web/what-do-mining-engineers-do/
http://study.com/articles/Construction_Engineer_Job_Description_Outlook_and_Duties.html
https://engineering.tamu.edu/civil/academics/degrees/specialty/construction
http://www.environmentalscience.org/career/environmental-engineer
http://www.softwareengineerinsider.com/articles/what-is-software-engineering.html#.Vr_ZyPmLS00
http://computingcareers.acm.org/?page_id=12
http://management.about.com/od/begintomanage/a/WhatDoesManagerDo.htm
http://www.forbes.com/sites/victorlipman/2013/09/09/5-things-the-best-managers-do-and-dont-do/#56234e0e3edd
https://www.linkedin.com/pulse/20140428100850-921823-what-managers-do-10-key-activities-you-need-to-master-as-manager
https://www.studentscholarships.org/salary/354/economists.php
https://en.wikipedia.org/wiki/Transportation_engineering
http://www.bls.gov/ooh/architecture-and-engineering/mechanical-engineers.htm
https://www.asme.org/
http://www.discovere.org/
http://www.livescience.com/47551-mechanical-engineering.html
IET: Becoming an Engineer
TopUniversities.com: Rankings for Engineering
Women in Engineering professional organization
http://www.livescience.com/47499-what-is-engineering.html
http://www.livescience.com/46021-what-is-a-transistor.html