МИНИСТЕРСТВО ОБРАЗОВАНИЯ РЕСПУБЛИКИ БЕЛАРУСЬ

Белорусский национальный технический университет
Филиал БНТУ
«Минский государственный политехнический колледж»

Учебно-методическое пособие по учебной дисциплине

ИНОСТРАННЫЙ ЯЗЫК (ПРОФЕССИОНАЛЬНАЯ ЛЕКСИКА)

для специальности 2-36 01 01
«Технология машиностроения (по направлениям)»

Электронный учебный материал

Минск 2019

Авторы:
Якименко Н.А., Соколова Т.Г.
Рецензенты:
Лягушевич С.И.
Кандидат филологических наук,
доцент кафедры «Иностранные языки» № 1 Белорусского государственного университета информатики и радиоэлектроники,

Соколова Т.Г.
Председатель цикловой комиссии иностранных языков,
филиала БНТУ «Минский государственный политехнический колледж»

Учебно-методическое пособие предназначено для самостоятельного и дистанционного изучения учебной дисциплины «Иностранный язык (профессиональная лексика)» для специальности 2-36 01 01 «Технология машиностроения (по направлениям)». В учебно-методическом пособии представлен теоретический и практический материал, контрольно-измерительный материал, обеспечивающий контроль и самоконтроль знаний для проведения текущей аттестации, а также дополнительные тексты для чтения в рамках самостоятельной работы с целью углубления знаний по учебной дисциплине.

Белорусский национальный технический университет.
Филиал БНТУ “Минский государственный политехнический колледж”.
пр - т Независимости, 85, г. Минск, Республика Беларусь
Тел.: (017) 292-13-42 Факс: 292-13-42
E-mail: mgpkby@bntu.by
http://www.mgpk.bntu.by/
Регистрационный № БНТУ/МГПК – 78.2019

СОДЕРЖАНИЕ

ПОЯСНИТЕЛЬНАЯ ЗАПИСКА

Электронное учебно-методическое пособие по учебной дисциплине «Иностранный язык (профессиональная лексика)» может использоваться преподавателями, учащимися дневной и заочной формы получения образования для самостоятельного и дистанционного изучения материала по учебной дисциплины «Иностранный язык (профессиональная лексика)» для специальности 2-36 01 01 «Технология машиностроения (по направлениям)».

В данном электронном учебно-методическом пособии представлены теоретический материал, практический материал, задания и вопросы для самоконтроля, видеофрагменты по ключевым темам типовой учебной программы для визуализации учебного материала, примерные задания к обязательной контрольной работе, дополнительные тексты для чтения в рамках самостоятельной работы с целью углубления знаний по учебной дисциплине и обратная связь.

Для просмотра электронного учебно-методического пособия, необходимо, чтобы было установлено следующее программное обеспечение:

- Adobe Reader - программа для просмотра и печати документов в формате PDF;
- Windows Media или Media Player Classic – программа для воспроизведения мультимедийных файлов.

Электронное учебно-методическое пособие является интерактивным, так как предлагает возможность перехода к необходимому материалу или разделу посредством гиперссылок.

Цель изучения дисциплины — формирование профессиональной иноязычной коммуникативной компетенции в соответствии с профилем подготовки, которая может быть представлена совокупностью:

- знаний лексического и грамматического минимума, необходимого для решения профессиональных задач средствами иностранного языка;
- коммуникативных умений в четырех видах речевой деятельности (восприятие и понимание речи на слух, говорение, чтение, письмо) в сфере профессионального общения;
- понимания ценности иностранного языка как средства познания и общения в профессиональной деятельности;
- готовности к самообразованию в области иностранного языка в соответствии с требованиями профессиональной деятельности специалиста.

Усвоение дисциплины неразрывно связано со знаниями таких дисциплин профессионального компонента, как «Технология автоматизированного производства», «Автоматизация технологической подготовки производства», «Производство заготовок», «Автоматизация производственных процессов в машиностроении», «Технология машиностроения», «Обработка материалов и инструментов», «Материаловедение и технология материалов», «Технологическая оснастка»,

«Охрана окружающей среды и энергосбережения». Реализация междисциплинарных связей обеспечивает профессиональную направленность будущего специалиста в соответствии со стандартом специальности.

ВЫПИСКА ИЗ ТИПОВОГО УЧЕБНОГО ПЛАНА

Специальность 2-36 01 01
«Технология машиностроения»

Учебная дисциплина «Иностранный язык (проф. лексика)»
изучается на протяжении 1семестра
(дневная форма обучения)

Виды работ	Количество часов
	8 семестр обучения
Всего часов	54
Из них: практических занятий	54
лабораторных работ	-
курсовое проектирование	-
Количество: тематических контрольных работ	-
обязательных контрольных работ	1
*домашних контрольных работ	-
Экзамен	-

МЕЖДИСЦИПЛИНАРНЫЕ СВЯЗИ

1. Технология автоматизированного производства.
2. Автоматизация технологической подготовки производства.
3. Производство заготовок.
4. Автоматизация производственных процессов в машиностроении.
5. Технология машиностроения.
6. Обработка материалов и инструмент.
7. Материаловедение и технология материалов.
8. Технологическая оснастка.
9. Охрана окружающей среды и энергосбережения.

МИНИСТЕРСТВО ОБРАЗОВАНИЯ РЕСПУБЛИКИ БЕЛАРУСЬ

УТВЕРЖДЕНО
Постановление Министерства
образования Республики Беларусь
23.06.2014 г. № 85

ТИПОВАЯ УЧЕБНАЯ ПРОГРАММА
ПО УЧЕБНОЙ ДИСЦИПЛИНЕ «ИНОСТРАННЫЙ ЯЗЫК (ПРОФЕССИОНАЛЬНАЯ ЛЕКСИКА)»

профессионального компонента типовых учебных планов по специальностям (направлениям специальностей) профилей образования I «Техника и технология» (кроме направлений образования 39 «Радиоэлектронная техника», 41 «Компоненты оборудования», 45 «Связь»), J «Архитектура и строительство», K «Сельское и лесное хозяйство. Садово-парковое строительство», направлений образования 94 «Защита от чрезвычайных ситуаций», группе специальностей 91 02 «Бытовое обслуживание» для реализации образовательных программ среднего специального образования, обеспечивающих получение квалификации специалиста со средним специальным образованием

Минск
2014

Рекомендовано к изданию экспертным советом Республиканского института профессионального образования

Автор *С.В. Вылегжанина,* преподаватель УО «Солигорский государ-
ственный горно-химический колледж».
Рецензенты: *О.В. Веремейчик,* заведующий кафедрой «Иностранные языки» Белорусского национального технического университета, кандидат педагогических наук;
Н.А. Якименко, преподаватель УО «Минский государственный политехнический колледж».

Ответственный за выпуск *Ю.И. Минальд,* начальник отдела УО «Республиканский институт профессионального образования».

Типовая учебная программа обсуждена и одобрена на заседаниях бюро УМО в сфере среднего специального образования на республиканском уровне по специальностям в области:

машиностроительного оборудования и технологии, металлургии;
химической и горнодобывающей промышленности;
энергетики;
легкой промышленности и бытового обслуживания; лесной и деревообрабатывающей промышленности; архитектуры и строительства.

ПОЯСНИТЕЛЬНАЯ ЗАПИСКА

Расширение международных связей делает иностранный язык востребованным в практической и интеллектуальной деятельности специалиста. Цель профессионально направленного обучения иностранному языку определяется социальным заказом общества и государства по отношению к языковому образованию рабочих кадров с учетом образовательной концепции учебной дисциплины «Иностранный язык».

Типовая учебная программа по учебной дисциплине «Иностранный язык (профессиональная лексика)» (далее - программа) предусматривает изучение профессионально направленного курса с учетом профиля профессиональной подготовки специалиста и конкретной квалификации.

Программа составлена с учетом связи ее учебного материала с программным учебным материалом специальных учебных дисциплин профессионального компонента. Профессионально направленный подход осуществляется практическим показом роли иноязычных знаний и умений в будущей профессиональной деятельности учащихся.

Основной целью изучения учебной дисциплины «Иностранный язык (профессиональная лексика)» является формирование профессиональной иноязычной коммуникативной компетенции в соответствии с профилем подготовки, которая может быть представлена совокупностью:

знаний лексического и грамматического минимума, необходимого для решения профессиональных задач средствами иностранного языка;

коммуникативных умений в четырех видах речевой деятельности (восприятие и понимание речи на слух, говорение, чтение, письмо) в сфере профессионального общения;

понимания ценности иностранного языка как средства познания и общения в профессиональной деятельности;

готовности к самообразованию в области иностранного языка в соответствии с требованиями профессиональной деятельности специалиста.

Достижение цели в единстве ее образовательного, развивающего и воспитательного аспектов предполагает решение комплекса задач:

формирование навыков чтения иностранных текстов профессиональной направленности, понимания высказывания в соответствии с ситуацией профессионального общения с учетом национально-культурных особенностей речевого поведения носителей языка; углубление и совершенствование базовых языковых знаний, расширение их профессионально ориентированной составляющей;

развитие умений использовать различные приемы, средства и возможности для самостоятельного изучения иностранных языков и их применения (аудио- или видеоматериалы, средства массовой информации, компьютерные учебные программы и др.);

формирование уважения к языку и культуре носителей языка, мотивации к повышению уровня владения иностранным языком в соответствии с требованиями профессиональной деятельности.

Программой определены цели по каждой теме и спрогнозированы результаты их достижения в соответствии с уровнями усвоения учебного материала.

В процессе изучения учебной дисциплины необходимо создавать условия:

для формирования умений интеллектуально-познавательной и практической деятельности в процессе общения на иностранном языке;

актуализации познавательной деятельности учащихся;

детального усвоения информации, превращения ее в прочные знания и убеждения, формирование умения использовать теоретические знания на практике;

формирования потребности в самообразовании и совершенствовании знаний и умений по иностранному языку в сфере профессиональной деятельности.

Программа разработана с учетом требуемых уровней усвоения учебного материала. Формулировка образовательных целей изучения каждой темы не только отражает сущность устанавливаемого уровня усвоения учебного материала («сформировать представление», «актуализировать знания», «выработать умения»), но и указывает на ожидаемый результат достижения этой цели путем описания деятельности учащихся («оперирует знаниями», «применяет» и т. д.).

В процессе преподавания учебной дисциплины необходимо учитывать, что ведущим видом профессиональной иноязычной речевой деятельности в обучении является чтение (включая перевод).

Количество учебных часов, отведенных на изучение учебной дисциплины, зависит от специальности (в соответствии с типовым учебным планом специальности (направления специальности)).

Содержательное лексическое наполнение тем второго раздела для каждой специальности (направления специальности), специализации должно производиться на основе выявления основных ситуаций профессиональной деятельности (предмет, средства и сфера профессиональной деятельности); требований образовательного стандарта и квалификационных характеристик специальности; требований к общепрофессиональным, специальным знаниям и умениям учащихся и носит вариативный характер, что позволяет учитывать профиль будущей специальности (направления специальности), специализации и учреждения образования. Для того чтобы наиболее полно выделить учебный терминологический словарь специальности (направления специальности), специализации по каждой теме, преподаватель иностранного языка совместно с преподавателями специальных учебных дисциплин

должен выбрать виды оборудования, инструменты, материалы, технологии, и т. д., которые отражают содержание сферы профессионального общения и будут изучаться на иностранном языке.

В образовательном процессе целесообразно использовать возможности информационно-телекоммуникационных технологий, формировать у учащихся навыки самостоятельной работы с учебниками, справочной и технической литературой.

Целесообразно в процессе обучения использовать деловые, ролевые и ситуационные игры, анализ производственных ситуаций.

С целью закрепления теоретических знаний и приобретения учащимися необходимых практических умений и навыков предусматривается проведение практических занятий, которые выполняются по заданию и при методическом руководстве преподавателя и проводятся с делением группы на подгруппы.

В целях контроля усвоения программного учебного материала программой предусмотрено проведение одной обязательной контрольной работы, задания для которой разрабатываются преподавателем учебной дисциплины и обсуждаются на заседании предметной (цикловой) комиссии учреждения образования.

В случае, когда типовым учебным планом по специальности (направлению специальности) бюджет времени, отведенного на изучение учебной дисциплины, составляет 30 учебных часов и менее, обязательная контрольная работа проводится на последнем занятии.

Программой определены цели изучения каждой темы, спрогнозированы результаты их достижения в соответствии с уровнями усвоения учебного материала.

В результате изучения учебной дисциплины «Иностранный язык» учащиеся должны

знать на уровне представления:

роль и место иностранного языка в профессиональном становлении и развитии личности;

страноведческую информацию, обогащающую социальный и профессиональный опыт;

знать на уровне понимания:

значение активного лексического минимума по изучаемым темам, в том числе оценочной лексики, реплик-клише профессионального речевого этикета;

значение грамматических явлений, отмеченных в содержании программы;

языковые средства и правила речевого поведения в соответствии со сферой общения и социальным статусом партнера по общению;

уметь:

чтение:

понимать тексты профессиональной направленности, используя основные виды чтения (ознакомительное, изучающее, поисковое / просмотровое); оценивать важность и новизну извлеченной информации и выражать свое отношение к ней. Объем текста, предназначенного для ознакомительного чтения, 3000-4000 печатных знаков с пробелами, тестов для изучающего чтения - 2500-3500 печатных знаков с пробелами. Виды текстов: статьи, тексты профессиональной направленности, рекламные проспекты, технические документы и др.;

говорение:

вести диалог (диалог-расспрос, диалог-обмен, диалог-побуждение к действию, этикетный диалог и их комбинации) в ситуациях профессионального общения в рамках изученной тематики (количество реплик каждого собеседника не менее 7-8 фраз);

беседовать, рассказывать, рассуждать в рамках изученной проблематики и тематики;

описывать и сравнивать предметы, факты, явления;

делать сообщения профессиональной направленности;

составлять монологическое высказывание - описание, сравнение, повествование, рассуждение, оценочное суждение (объем высказывания 15-20 фраз, правильно оформленных в языковом отношении);

восприятие и понимание речи на слух:

относительно полно и точно понимать высказывания собеседника в распространенных ситуациях профессионального общения; понимать основное содержание и извлекать необходимую информацию из звучащих текстов профессиональной направленности, содержащих 3-4 % незнакомых слов, значение которых можно понять с помощью языковой или контекстуальной догадки (длительность звучания текста 2,5 мин);

письменная речь:

составлять и оформлять письменное сообщение в рамках изучаемой темы, объявление в соответствии с нормами, принятыми в стране изучаемого языка, делать выписки из текстов.

В программе приведены примерные критерии оценки результатов учебной деятельности учащихся по учебной дисциплине, разработанные на основе десятибалльной шкалы и показателей оценки результатов учебной деятельности обучающихся в учреждениях среднего специального образования (постановление Министерства образования Республики Беларусь от 29.03.2004 № 17).

Приведенный в программе тематический план является рекомендательным. Предметная (цикловая) комиссия учреждения образования может вносить обоснованные изменения в содержание программного учебного материала и распределение учебных часов по темам в пределах общего бюджета времени, отведенного на изучение учебной дисциплины, в последовательность изложения учебного материала, а также определять тематику практических работ. Все изменения должны быть утверждены заместителем руководителя учреждения образования по учебной работе.

ТРЕБОВАНИЯ К ПРАКТИЧЕСКОМУ ВЛАДЕНИЮ ВИДАМИ РЕЧЕВОЙ ДЕЯТЕЛЬНОСТИ

Восприятие и понимание речи на слух

Развитие навыков и умений смыслового восприятия устной иноязычной речи в ситуациях профессионального общения: выделять основную информацию в воспринимаемом на слух тексте профессионального характера; относительно полно понимать речь собеседника в ситуациях профессионального общения.

Говорение

Диалогическая речь

Овладение тактикой построения диалога в соответствии с коммуникативной задачей, речевыми намерениями собеседника с учетом конкретных условий профессионально ориентированного общения с соблюдением норм речевого этикета, принятых в стране изучаемого языка.

Развитие умений участвовать в беседе, запрашивать и обмениваться информацией, высказывать и аргументировать свою точку зрения; расспрашивать собеседника, уточняя интересующую информацию; брать на себя инициативу в разговоре; вносить пояснения, дополнения; выражать эмоции различного характера.

Монологическая речь

Построение устного монологического высказывания в соответствии с коммуникативной задачей.

Развитие умений делать сообщения, содержащие наиболее важную информацию по теме / проблеме профессионального характера; кратко передавать содержание полученной информации; рассуждать о фактах / событиях; делать выводы, оценивать факты.

Чтение

Совершенствование всех видов чтения на основе текстов профессионального характера. Учащиеся должны понимать тексты профессионального характера с разной полнотой, точностью и глубиной проникновения в их содержание в зависимости от вида чтения:

ознакомительное чтение - понимать основное содержание несложных текстов профессионального характера;

изучающее чтение - полно и точно понимать содержание несложных текстов профессионального характера;

просмотровое / поисковое чтение - извлекать необходимую (значимую) информацию из текстов профессионального характера.

При этом учащиеся овладевают умениями извлекать необходимую информацию, перерабатывать ее, работая с такими текстовыми материалами, как:

тексты профессиональной направленности, в том числе руководства по эксплуатации, монтажу, ремонту, технические инструкции, технологические карты и т. п.;

надписи на ярлыках, этикетках, упаковках и т. п.

Учащиеся овладевают умениями понимать текстовые материалы:

прибегая (не прибегая) к использованию специального словаря;

используя иллюстрации, языковую догадку;

принимая во внимание сходство терминов в разных языках.

Совершенствование умения пользоваться языковой и контекстуальной догадкой при чтении текстов профессионального характера: прогнозировать содержание текста по заголовку, началу; использовать текстовые опоры - подзаголовки, таблицы, графики, шрифтовые выделения, комментарии, сноски и т. п.

Письменная речь

Конструирование письменного текста в соответствии с коммуникативной задачей.

Развитие умений сообщать сведения о своей организации в форме, принятой в стране изучаемого языка; составлять и оформлять тексты рекламных объявлений, деловых писем профессионального характера; заполнять типовые формуляры; фиксировать необходимую информацию из прочитанного / прослушанного в ситуациях профессионального иноязычного общения.

ЯЗЫКОВОЙ МАТЕРИАЛ

Орфография

Совершенствование орфографических навыков применительно к языковому материалу тем программы.

Фонетика

Совершенствование слухо-произносительных и ритмико-интонационных навыков.

Лексика

Расширение продуктивного и рецептивного лексического минимума за счет лексических средств, обслуживающих ситуации профессионального общения, а также оценочной лексики, реплик-клише профессионального речевого этикета, отражающих особенности культуры страны изучаемого языка.

Накопление и расширение потенциального словаря за счет овладения словообразовательными моделями, интернациональной лексикой.

Грамматика

Совершенствование грамматических навыков. Расширение активного и рецептивного грамматического минимума за счет грамматических средств, обслуживающих ситуации профессионального общения.

Грамматический материал:

категории числа существительного;

степени сравнения прилагательных и наречий;

глагол; видо-временные формы глагола; пассивный, активный залог; наклонение глагола;

модальные глаголы; прямая и

косвенная речь;

словообразование.

ПРИМЕРНЫЙ ТЕМАТИЧЕСКИЙ ПЛАН

Раздел, тема	Количество учебных часов
Введение	**1**
Раздел 1. **Вводно-коррективный курс**	**3**
1.1. Лексико-фонетический и орфографический материал	1
1.2. Лексико-грамматический материал	2
Раздел 2. **Основной курс**	**16-56**
2.1. Компетенции специалиста	2
2.2. Профессиональное самоопределение личности	2
2.3. Оборудование, инструменты, приспособления и материалы (сырье)	6-24
2.4. Производственные процессы и технологии	5-23
Обязательная контрольная работа	1
2.5. Ресурсосберегающие технологии. Экологическая безопасность производственных процессов	0-4
И т о г о	**20-60**

СОДЕРЖАНИЕ ПРОГРАММЫ

Цель изучения темы	Содержание темы	Результат
ВВЕДЕНИЕ		
Ознакомить с целями и задачами учебной дисциплины, ее связью с другими учебными дисциплинами учебного плана по специальности (направлению специальности), специализации, значением в подготовке специалистов среднего звена. Сформировать представление о роли и месте иностранного языка в профессиональном становлении и развитии личности.	Цели и задачи учебной дисциплины «Иностранный язык (профессиональная лексика)», ее связь с другими учебными дисциплинами учебного плана по специальности (направлению специальности), специализации, значение в подготовке специалистов среднего звена. Роль иностранного языка в профессиональном общении, профессиональном становлении и развитии личности.	Высказывает общее суждение о целях и задачах учебной дисциплины «Иностранный язык (профессиональная лексика)», ее связи с другими дисциплинами учебного плана по специальности (направлению специальности), специализации, значении в подготовке специалистов среднего звена, роли иностранного языка в профессиональном становлении и развитии личности.
РАЗДЕЛ 1. ВВОДНО-КОРРЕКТИВНЫЙ КУРС		
Тема 1.1. **Лексико-фонетический и орфографический материал**		
Актуализировать знания основных фонетических и орфографических правил, полученные ранее при изучении курса иностранного языка. Научить применять основные фонетические и орфографические правила при произношении, чтении, написании профессиональных терминов.	Повторение основного фонетического материала и правил правописания, действующих в современном иностранном языке. Правила чтения. Ударение. Интонация. Система упражнений фонетико-орфографического содержания. Правила работы со словарем. Основные правила орфографии языка. Трудные случаи правописания. Применение основных фонетических и орфографических правил при произношении, чтении, написании профессиональных терминов.	Формулирует основные правила фонетики, правописания. Применяет основные фонетические и орфографические правила в различных видах речевой деятельности при профессионально-ориентированном общении и работе с профессионально-ориентированными текстами.
Тема 1.2. **Лексико-грамматический материал**		
Актуализировать знания основных грамматических правил, полученные ранее при изучении курса иностранного языка. Углубить базовые языковые знания, расширить их профессиональную составляющую, совершенствовать базовые языковые навыки, необходимые для решения профессиональных задач средствами иностранного	Повторение основных грамматических правил. Типы предложений. Порядок слов в предложении. Сложные предложения. Категории рода и числа существительных. Степени сравнения прилагательных и наречий. Временные формы глаголов. Модальные глаголы. Действительный и страдательный залог.	Формулирует основные правила грамматики, применяет их в устной и письменной речи. Применяет основные грамматические правила в различных видах речевой деятельности при профессионально-ориентированном общении и работе с профессионально-ориентированными тестами.

языка.	Технический перевод. Переводческие приемы и способы.	Совершенствует приемы работы с учебным материалом (с текстом, лексикой; со справочной литературой), переводческие приемы и способы.
РАЗДЕЛ 2. Основной КУРС		
Тема 2.1. **Компетенции специалиста**		
Лексико-термшологическое наполнение		
Сформировать знание лексических единиц в рамках темы.	Исторические предпосылки возникновения профессии. Развитие отрасли на современном этапе. Перспективы развития от расли. Будущая специальность, профессия. Основные виды деятельности и функции специалиста. Должностные обязанности. Рабочий день. Условия работы.	Раскрывает значение изученных лексических единиц. Использует новые лексические единицы и разговорные клише при различных видах речевой деятельности в профессионально-ориентированном общении.
Ситуации опосредованного общения		
Научить максимально полно и точно понимать содержание текстов профессиональной направленности, критически осмысливать его.	Чтение и перевод текстов профессиональной направленности с пониманием основной и второстепенной информации, поиск, отбор, извлечение, преобразование необходимой информации.	Читает вслух правильно в звуковом и интонационном отношении языковом материале в пределах изучаемой темы, переводит текст с использованием словаря. Определяет познавательную ценность, устанавливает смысл прочитанного, выделяет основную и второстепенную информацию в тексте, излагает основные мысли текста более экономным способом.
Ситуации непосредственного общения		
Научить оперировать языковым материалом в монологической и диалогической речи в рамках темы, понимать содержание и смысл иноязычного высказывания в условиях ситуативного профессионального общения.	Построение устного монологического и диалогического высказывания в рамках темы для решения коммуникативных задач: аргументация той или иной точки зрения, обмен мнениями о состояниях и перспективах развития отрасли в Республике Беларусь и за рубежом, сообщение сведений о будущей специальности, об условиях работы, о рабочем	Интонационно и ритмически правильно оформляет иноязычную речь, оперирует языковым материалом по теме; владеет навыками и умениями, необходимыми для реализации предложенной ситуации профессионального общения в рамках темы, понимает содержание иноязычного высказывания в условиях ситуативного профессионального общения.

	дне.	
Тема 2.2. **Профессиональное самоопределение**		
Лексико-терминологическое наполнение		
Сформировать знание лексических единиц в рамках темы. Сформировать умение использовать новые лексические единицы и разговорные клише в различных видах речевой деятельности при профессионально-ориентированном общении в рамках изучаемой темы.	Выбор профессии. Мотивы выбора профессии. Пути приобретения профессии. Перспективы профессионального роста. Обучение в течение жизни как неотъемлемая составляющая профессионализма в современных условиях. Имидж, внешний вид, одежда. Качества личности и профессия. Резюме, знакомство, деловое представление, заявление о приеме на работу. Собеседование о приеме на работу.	Раскрывает значение лексических единиц в рамках темы. Использует новые лексические единицы и разговорные клише в различных видах речевой деятельности при профессионально-ориентированном общении.
Ситуации опосредованного общения		
Научить максимально полно и точно понимать содержание текстов профессиональной направленности, критически осмысливать его.	Чтение и перевод текстов профессиональной направленности с пониманием основной и второстепенной информации, поиск, отбор, извлечение, преобразование необходимой информации.	Определяет познавательную ценность, устанавливает смысл прочитанного, выделяет основную и второстепенную информацию в тексте, излагает основные мысли текста более экономным способом.
Ситуации непосредственного общения		
Научить оперировать языковым материалом в монологической и диалогической речи в рамках темы, понимать содержание и смысл иноязычного высказывания в условиях ситуативного профессионального общения.	Построение устного монологического и диалогического высказывания в рамках темы для решения коммуникативных задач: аргументация личной точки зрения о перспективах профессионального роста, запрос информации о требованиях к внешнему виду, психологическим качествам представителей профессии, обмен мнениями об особенностях профессии; сообщение информации о себе как о специалисте и др.	Интонационно и ритмически правильно оформляет иноязычную речь, оперирует языковым материалом по теме в монологической и диалогической речи в предложенной ситуации профессионального общения; понимает содержание и смысл иноязычного высказывания в условиях ситуативного профессионального общения.
Тема 2.3. **Оборудование, инструменты, приспособления и материалы (сырье)**		
Лексико-терминологическое наполнение		
Сформировать знание лексических единиц в рамках темы.	Оборудование, инструменты, приспособления и материалы (сырье),	Раскрывает значение лексических единиц в рамках темы.

Сформировать умение использовать новые лексические единицы и разговорные клише в различных видах речевой деятельности при профессионально-ориентированном общении.	используемые в производственных процессах. Оборудование: виды, название, назначение, устройство, краткая характеристика, технический паспорт. Инструменты, приспособления: виды, название, назначение, краткая характеристика. Материалы (сырье): название, свойства, область применения.	Использует новые лексические единицы и разговорные клише в различных видах речевой деятельности при профессионально-ориентированном общении.
Ситуации опосредованного общения		
Научить максимально полно и точно понимать содержание текстов профессиональной направленности, критически осмысливать его, извлекать необходимую информацию из текстов профессиональной направленности. Сформировать навык лексико-грамматического оформления письменного высказывания на иностранном языке в качестве вспомогательного средства для выполнения различных коммуникативных задач в рамках темы.	Чтение технической документации (руководства по эксплуатации, монтажу, ремонту, технические инструкции, технологические карты и др.). Конструирование письменного текста в соответствии с коммуникативной задачей: запрос информации, обмен информацией и др.	Определяет познавательную ценность, устанавливает смысл прочитанного, выделяет основную и второстепенную информацию в тексте, излагает основные мысли текста более экономным способом. Оформляет письменное высказывание на иностранном языке в соответствии с поставленной коммуникативной задачей в рамках темы.
Ситуации непосредственного общения		
Научить оперировать языковым материалом в монологической и диалогической речи в рамках темы, понимать содержание и смысл иноязычного высказывания	Построение устного монологического и диалогического высказывания в рамках темы для решения коммуникативных задач: аргументация той или иной точки зрения, лов (сырья) или оборудования и т. п., осуществление обмена информацией	Оперирует языковым материалом в монологической и диалогической речи в предложенной ситуации профессионального общения. Интонационно и ритмически правильно оформляет иноязычную речь; понимает содержание и смысл иноязычного высказывания в условиях ситуативного
Тема 2.4. **Производственные процессы и технологии**		
Лексико-термшологическое наполнение		
Сформировать знание лексических единиц в рамках	Производственный процесс: этапы, планирование и	Раскрывает значение лексических единиц в рамках

темы.	организация технологическое оборудование: техническое обслуживание, неисправности, ремонт, разборка / сборка, регулировка, испытание оборудования. Требования безопасности при эксплуатации оборудования. Объект профессиональной деятельности или выпускаемая продукция. Контроль качества выпускаемой продукции	темы.
	Ситуации опосредованного общения	
Научить максимально полно и точно понимать содержание текстов профессиональной направленности, критически осмысливать его, извлекать необходимую информацию из текстов профессиональной направленности. Сформировать навык лексико-грамматического оформления письменного высказывания на иностранном языке в соответствии с поставленной коммуникативной задачей в рамках темы.	Чтение текстов профессиональной направленности с пониманием основной и второстепенной информации. Перевод специальных текстов со словарем. Поиск, отбор, извлечение, преобразование необходимой информации. Использование технической документации. Конструирование письменного текста в соответствии с коммуникативной задачей: запрос информации, обмен информацией (запрос информации о наличии запасных частей, о возможностях поставки оборудования и т.п.).	Определяет познавательную ценность, устанавливает смысл прочитанного, выделяет основную и второстепенную информацию в тексте, излагает основные мысли текста более экономным способом. Оформляет письменное высказывание на иностранном языке в соответствии с поставленной коммуникативной задачей в рамках темы.
	Ситуации непосредственного общения	
Научить оперировать языковым материалом в монологической и диалогической речи в рамках темы, понимать содержание и смысл иноязычного высказывания в условиях ситуативного профессионального общения.	Построение устного монологического и диалогического высказывания в рамках темы для решения коммуникативных задач: аргументация той или иной точки зрения (о преимуществах использования того или иного оборудования), запрос информации, осуществление обмена информацией.	Оперирует языковым материалом в монологической и диалогической речи в предложенной ситуации профессионального общения. Интонационно и ритмически правильно оформляет иноязычную речь; понимает содержание и смысл иноязычного высказывания в условиях ситуативного профессионального общения.
	Обязательная контрольная работа	
	Тема 2.5. **Ресурсосберегающие технологии. Экологическая безопасность**	
	Лексико-терминологическое наполнение	
Сформировать знание	Современное развитие науки и	Раскрывает значение

лексических единиц в рамках темы	техники (на примере отрасли); использование ресурсосберегающих технологий на производстве. Электронные устройства, Интернет и информационные технологии в профессиональной деятельности. Экологические проблемы, источники и последствия загрязнения окружающей среды. Требования в области охраны окружающей среды. Современные способы решения экологических проблем. Экологическая культура профессиональной деятельности.	лексических единиц в рамках темы.
Ситуации опосредованного общения		
Научить максимально полно и точно понимать содержание текстов профессиональной направленности, критически осмысливать его, извлекать необходимую информацию. Сформировать навык лексико-грамматического оформления письменного высказывания на иностранном языке в соответствии с поставленной коммуникативной задачей в рамках темы.	Чтение текстов профессиональной направленности с пониманием основной и второстепенной информации. Перевод специальных текстов со словарем. Поиск, отбор, извлечение, преобразование необходимой информации. Конструирование письменного текста в соответствии с коммуникативной задачей: запрос информации, обмен информацией.	Определяет познавательную ценность, устанавливает смысл прочитанного, выделяет основную и второстепенную информацию в тексте, излагает основные мысли текста более экономным способом. Оформляет письменное высказывание на иностранном языке в соответствии с поставленной коммуникативной задачей в рамках темы.
Ситуации непосредственного общения		
Научить оперировать языковым материалом в монологической и диалогической речи в рамках темы, понимать содержание и смысл иноязычного высказывания в условиях ситуативного профессионального общения	Построение устного монологического и диалогического высказывания в рамках темы для решения коммуникативных задач: аргументация той или иной точки зрения, запрос информации, осуществление обмена информацией и др.	Оперирует языковым материалом в монологической и диалогической речи в предложенной ситуации профессионального общения. Интонационно и ритмически правильно оформляет иноязычную речь; понимает содержание и смысл иноязычного высказывания в условиях ситуативного профессионального общения

Примерные критерии оценки результатов учебной деятельности учащихся

Оценка в баллах	Показатели оценки
1 (один)	Узнавание отдельных объектов изучения программного учебного материала, предъявленных в готовом виде (основных терминов, словосочетаний, фраз и т. д.). Коммуникативная задача не решена. Диалогическое общение, монологическое высказывание, письменное высказывание сводятся к отдельным словам и словосочетаниям. Различение отдельных фактов текста при чтении и восприятии речи на слух
2 (два)	Различение объектов изучения программного учебного материала, предъявленных в готовом виде. Коммуникативная задача не решена. При чтении и восприятии речи на слух не выявлены изложенные в тексте факты и события. В диалогической речи реакция на реплики собеседника практически отсутствует. В монологическом, письменном высказывании отсутствует логика и связность. Используемые языковые и речевые средства не соответствуют ситуации профессионального общения. Допущено значительное количество ошибок, препятствующих коммуникации
3 (три)	Воспроизведение части программного учебного материала по памяти. Коммуникативная задача решена частично. При чтении и восприятии речи на слух не выявлены основные факты, события, детали текста, не дифференцируется основная и второстепенная информация. Диалогическое высказывание в значительной степени не соответствует предложенной ситуации профессионального общения, учащийся испытывает значительные затруднения в поддержании беседы. В монологическом, письменном высказывании отсутствует логика и последовательность изложения. Речь не беглая со значительным количеством пауз. Используемые языковые и речевые средства не соответствуют ситуации профессионального общения. Компенсаторные умения не используются. Допущено значительное количество ошибок, препятствующих коммуникации
4 (четыре)	Недостаточно осознанное воспроизведение большей части программного учебного материала. Применение знаний в знакомой ситуации по образцу. Коммуникативная задача решена частично. при чтении и восприятии речи на слух есть существенные нарушения в выявлении основных фактов, событий текста, отдельных деталей текста, затруднения в различении основной и второстепенной информации. Диалогическое высказывание в значительной степени не соответствует предложенной ситуации профессионального общения, учащийся испытывает значительные затруднения в поддержании беседы. В монологическом, письменном высказывании нарушена логика и последовательность изложения. Речь не беглая, со значительным количеством пауз. Используемые языковые и речевые средства значительной степени не соответствует предложенной ситуации

	профессионального общения, учащийся испытывает значительные затруднения в поддержании беседы. В монологическом, письменном высказывании нарушена логика и последовательность изложения. Речь не беглая, со значительным количеством пауз. Используемые языковые и речевые средства не всегда соответствуют ситуации профессионального общения. Компенсаторные умения не используются. Допущен ряд ошибок, затрудняющих коммуникацию
5 (пять)	Осознанное воспроизведение большей части программного учебного материала. Применение знаний в знакомой ситуации по образцу. Коммуникативная задача решена не полностью. При чтении и восприятии речи на слух есть существенные нарушения в выявлении основных фактов, событий текста, выявлены не все детали текста, имеются затруднения в различении основной и второстепенной информации, отсутствует оценка новизны (значимости) извлеченной из текста информации. Диалогическое высказывание недостаточно соответствует ситуации профессионального общения, учащийся испытывает затруднения в поддержании беседы. В монологическом, письменном высказывании значительно нарушена логика и последовательность изложения, не выражает своего отношения к обсуждаемой проблеме, теме. Речь не достаточно беглая. Используемые языковые и речевые средства не всегда соответствуют ситуации профессионального общения. Компенсаторные умения не используются. Допущен ряд ошибок, частично влияющих на процесс коммуникации
6 (шесть)	Полное знание и осознанное воспроизведение всего программного учебного материала; владение программным учебным материалом в знакомой ситуации. Коммуникативная задача в основном решена. При чтении и восприятии речи на слух есть искажения в выявлении основных фактов, событий текста, выявлены не все детали текста, имеются затруднения в различении основной и второстепенной информации, отсутствует оценка новизны (значимости) извлеченной из текста информации. Диалогическое высказывание в основном соответствует предложенной ситуации профессионального общения, учащийся умеет поддерживать беседу. В монологическом письменном высказывании имеются нарушения логики и последовательности изложения, не выражает своего отношения к обсуждаемой проблеме, теме. Речь недостаточно беглая. Используемые языковые и речевые средства не всегда соответствуют ситуации профессионального общения. Недостаточно используются компенсаторные умения. Допущен ряд ошибок, частично влияющих на процесс коммуникации
7 (семь)	Полное, прочное знание и воспроизведение программного учебного материала. Владение программным учебным материалом в знакомой ситуации. Коммуникативная задача решена относительно полно. При чтении и восприятии речи на слух определены тема (проблема) текста, основные факты, события, детали текста, дифференцирована

	основная и второстепенная информация, отсутствует оценка новизны (значимости) извлеченной из текста информации. Диалогическое высказывание соответствует предложенной ситуации профессионального общения, учащийся умеет поддерживать беседу. В монологическом, письменном высказывании имеются незначительные нарушения логики и последовательности изложения, есть затруднения в выражении своего отношения к обсуждаемой проблеме, теме. Речь достаточно беглая. Используемые языковые и речевые средства в основном соответствуют ситуации профессионального общения. В случае затруднений используются компенсаторные умения. Допущены отдельные ошибки
8 (восемь)	Полное, прочное, глубокое знание и воспроизведение программного учебного материала. Оперирование программным учебным материалом в знакомой ситуации. Коммуникативная задача решена относительно полно. При чтении и восприятии речи на слух определены тема (проблема) текста, основные факты, события, выявлены детали текста, дифференцирована основная и второстепенная информация. Затруднения в оценке новизны (значимости) извлеченной из текста информации. Диалогическое высказывание соответствует предложенной ситуации профессионального общения, учащийся умеет поддерживать беседу. Монологическое, письменное высказывание построено логично и связно, есть затруднения в выражении своего отношения к обсуждаемой проблеме, теме. Речь беглая. Используемые языковые и речевые средства соответствуют ситуации профессионального общения. В случае затруднений используются компенсаторные умения. Допущены отдельные ошибки, не препятствующие коммуникации
9 (девять)	Полное, прочное, глубокое, системное знание программного учебного материала; оперирование программным учебным материалом в частично измененной ситуации. Коммуникативная задача решена полностью. При чтении и восприятии речи на слух определены тема (проблема) текста, основные факты, события, выявлены все детали текста, дифференцирована основная и второстепенная информация, дана оценка новизне (значимости) извлеченной из текста информации. Диалогическое высказывание соответствует предложенной ситуации профессионального общения, учащийся умеет инициировать и поддерживать беседу. Монологическое, письменное высказывание построено логично и связно, выражено свое отношение к обсуждаемой проблеме, теме. Речь беглая. Используемые языковые и речевые средства соответствуют ситуации профессионального общения. В случае затруднений используются компенсаторные умения. Допущены единичные ошибки, не препятствующие коммуникации
10 (десять)	Свободное оперирование программным учебным материалом. Применение знаний и умений в незнакомой ситуации. Коммуникативная задача решена полностью. При чтении и восприятии речи на слух определены тема (проблема) текста, основные факты, события,

	выявлены все детали текста, дифференцирована основная и второстепенная информация, обобщены основные факты, изложенные в тексте, дана оценка новизне (значимости) извлеченной из текста информации. Диалогическое высказывание соответствует предложенной ситуации профессионального общения, учащийся умеет инициировать и поддерживать беседу. Монологическое, письменное высказывание построено логично и связно, выражено свое отношение к обсуждаемой проблеме, теме. Речь беглая. Используемые языковые и речевые средства соответствуют ситуации профессионального общения. В случае необходимости используются компенсаторные умения. Допущены единичные ошибки, не препятствующие коммуникации

Примечание. При отсутствии результатов учебной деятельности обучающимся в учреждении среднего специального образования выставляется «0» (ноль) баллов.

ПРИМЕРНЫЙ ПЕРЕЧЕНЬ ОСНАЩЕНИЯ КАБИНЕТА

Наименование	Количество
Технические средства обучения	
Технические устройства*	
Интерактивная доска	1
Компьютер	1
Мультимедийный проектор	1
Электронные средства обучения	
Электронный учебник	3
«Reward InterN@tive» Macmillan Publishers Limited	
Обучающие программы	
«Профессор Хиггинс. Английский без акцента!». НПЦ «Istra-soft»	
EBC (English Business Contracts) TOQ «Медиахаус»	
«English Platimirn» ТОО «Мультимедиа Технологии»	
Инструментальная программа для создания упражнений и тестовых заданий «LingoFox»	1
Энциклопедии	2
www.britanica.org (английский язык)	
www.Wikipedia.org (английский язык)	
Обучающие тесты	
www.englishclub.net (английский язык)	
Информационные сайты для самостоятельной работы	
www.deutschland.de (немецкий язык)	
www.english-to-go.com (английский язык)	
www.globalenvision.org (английский язык)	
www.goethe.de (немецкий язык)	
www.hueber.de (немецкий язык)	
www.wikipedia.de (немецкий язык)	
Средства обучения для проведения практических занятий	
Методические материалы для проведения практических занятий	15
Оборудование кабинета	
Доска классная	1
Стенд информационный	1
Стол для преподавателя	1
Стол для учащихся	15
Стул	31
Шкаф для наглядных пособий	1
Экран проекционный	1

При отсутствии использовать специализированную аудиторию технических средств обучения.

ЛИТЕРАТУРА

Английский язык

Grant, D. Business Basics. Students' Book / D. Grant, R. McLaity. Oxford University Press, 1999.

Khvedchenya, L.V. Highlights. Course Book 1, 2 / L.V. Khvedchenya. Ed. 3. Minsk, 2006.

Mascull, B. Key Words in Science and Technology / B. Mascull. Collins Cobuild, 1997.

Murphy, R English Grammar in Use / R. Murphy. CUP, 1997.

Revell, J. Advanced Listening / J. Revell, B. Breaiy. Oxford University Press,1998.

Vince, M. Intermediate Language Practice / M. Vince. Macmillan Publishers Limited, 1998.

Агабекян, И.П. Английский для технических вузов / И.П. Агабекян, И.П. Коваленко. Ростов н/Д, 2002.

Английский язык для инженеров / Т.Ю. Полякова [и др.]. Минск, 2006.

Английский язык для студентов технических вузов / С.А. Хоменко [и др.]. Минск, 2004.

Англо-русский словарь по горному делу : приложение к учебному пособию «English for Miners» / сост. Л.Л. Графова. М., 2012. **Графова, Л.Л.** English for Miners. Профессионально-ориентированный курс английского языка : учеб. пособие для вузов / Л.Л. Графова, В.Т. Бабичев. М., 2010.

Орловская, И.В. Учебник английского языка для студентов технических университетов и вузов / И.В. Орловская, Л.С. Самсонова, А.И. Скубриева. М., 2005.

Сатинова, В.Ф. Читаем и говорим о Британии и британцах / В.Ф. Сатинова. Минск, 2000.

Трухан, Е.В. Английский язык для энергетиков : учеб. пособие / Е.В. Трухан, О.Н. Кобяк. Минск, 2011.

Хведченя, Л.В. Практическая грамматика современного английского языка / Л.В. Хведченя, Р.В. Хорень, И.В. Крюковская. Минск, 2002.

Христорождественская, Л.П. Английский язык. Практический курс /Минск, 2004.

Учебное издание

Вылегжанина Светлана Викторовна

ТИПОВАЯ УЧЕБНАЯ ПРОГРАММА ПО УЧЕБНОЙ ДИСЦИПЛИНЕ «ИНОСТРАННЫЙ ЯЗЫК (ПРОФЕССИОНАЛЬНАЯ ЛЕКСИКА)»

профессионального компонента типовых учебных планов по специальностям (направлениям специальностей) профилей образования I «Техника и технология» (кроме направлений образования 39 «Радиоэлектронная техника», 41 «Компоненты оборудования», 45 «Связь»), J «Архитектура и строительство», K «Сельское и лесное хозяйство. Садово-парковое строительство», направлений образования 94 «Защита от чрезвычайных ситуаций», группе специальностей 91 02 «Бытовое обслуживание» для реализации образовательных программ среднего специального образования, обеспечивающих получение квалификации специалиста со средним специальным образованием

Редактор *Л.Э. Татьянок* Компьютерная верстка *А. О. Лабун*

Подписано в печать 11.07.14. Формат 60х84/16. Гарнитура «Таймс». Бумага офсетная. Усл. печ. л. 1,4. Уч.-изд. л. 1,21. Тираж 70 экз. Код 45/14. Заказ 187. Республиканский институт профессионального образования. Свидетельство о государственной регистрации издателя, изготовителя, распространителя печатных изданий № 1/245 от 27.03.2014. Ул. К. Либкнехта, 32, 220004, Минск. Тел.: 226 41 00, 200 43 88.

Отпечатано на ризографе Республиканского института профессионального образования. Ул. К. Либкнехта, 32, 220004, Минск. Тел. 200 69 45.

СУЩЕСТВЕННЫЕ И НЕСУЩЕСТВЕННЫЕ

Вид речевой деятельности	Существенные ошибки	Несущественные ошибки
Говорение	1. Использование языка на уровне отдельных слов и словосочетаний. ерный порядок слов в предложении. 3. Ограниченный словарный запас для выражения мысли. 4. Фонетические, лексические и грамматические ошибки в изученном материале, затрудняющие понимание высказывания говорящего. 5. Структурно- стилистические ошибки в организации устного высказывания. 6. Ограниченный объём высказывания.	1. Неверное использов. идиоматических речевых оборотов, обусловленных интерференцией родного языка. 2. Пропуск или неверное употребление артиклей. 3. Неверное употребление предлогов, не искажающих смысл высказывания. 4. Неверный порядок прилагательных перед именем существительным. 5. Словообразовательные ошибки, не затрудняющие понимание высказывания.
Чтение/ Восприятие речи на слух	1. Узнавание отдельных слов и фраз при чтении и слушании текста. 2. Замещение одного звука или слова другим, искажающим смысловое содержание предложения. 3. Незнание правил чтения. 4. Частичное воспроизведение материала на уровне отдельных слов и предложений.	1. Фонетические ошибки в произношении незнакомых буквосочетаний, слов и словосочетаний. 2. Воспроизведение интонации иноязычного предложения по правилам родного языка. 3. Перефразирование услышанного или прочитанного контекста по правилам родного языка с некоторым нарушением структурных норм изучаемого ин. языка.
Письменная речь	1. Выражение мысли на уровне отдельных слов и словосочетаний. 2. Употребление слов в ненормативных значениях, нарушение лексической сочетаемости, повторы, тавтология. 3. Неверное употребление глагольных форм и несоблюдение согласования времён. 4. Оформление письменных высказываний по правилам родного языка с нарушением структурно-стилистических норм изучаемого иностранного языка. 5. Ограниченный объём высказывания.	1.Пунктуация иноязычного предложения по правилам родного языка. 2. Неверное использов. идиоматических речевых оборотов, обусловленных интерференцией родного языка. 3. Согласование подлежащего и сказуемого в единственном числе 3 лице. 4. Пропуск необходимых элементов, не существенно затрудняющих понимание написанного. 5. Словообразовательные ошибки, не затрудняющие понимание высказывания.
Перевод	1.Перевод текста на уровне отдельных словосочетаний и предложений. 2. Присутствуют грубые искажения в передаче содержания. 3. Присутствуют смысловые и терминологические искажения, нарушающие правильность передачи содержания.	1.Присутствуют незначительные искажения в передаче содержания. 2. Присутствуют незначительные искажения смысла и терминологии, не нарушающие правильность передачи содержания.

ТЕМАТИЧЕСКИЙ ПЛАН

Раздел, тема	Количество учебных часов
Введение Цель и задачи учебной дисциплины, роль иностранного языка в профессиональной деятельности специалиста.	**1**
Раздел 1. **Вводно-коррективный курс**	**3**
1.1 Лексико-фонетический и орфографический материал. Повторение правил чтения. Правила работы со словарём.	1
1.2 Лексико-грамматический материал. Порядок слов в предложении. Категория числа существительных. Степени сравнения прилагательных. Видовременные формы глагола.	2
Раздел 2. **Основной курс**	**50**
2.1 Компетенции специалиста.	2
2.2 Профессиональное самоопределение личности.	2
2.3 Оборудование, инструменты, приспособления и материалы.	24
2.3.1 Универсальные приспособления.	2
2.3.2 Режущий инструмент. Инструмент токарной обработки. Резцы.	4
2.3.3 Конструкционные материалы. Металлы и не металлы.	2
2.3.4 Инструментальные материалы. Стали, чугуны, сплавы.	6
2.3.5 Станки сверлильные, токарные, фрезерные, шлифовальные.	8
2.3.6 Мастерские.	2
2.4 Производственные процессы и технологии.	22
2.4.1 Производственный процесс. Состав и структура.	2
2.4.2 Технологический процесс. Металлообработка. Прокатка, Экструзия.	4
2.4.3 Технологический процесс. Волочение. Штамповка листового металла.	4
2.4.4 Резание. Фрезерование. Сверление, Шлифование.	8
Обязательная контрольная работа	1
2.5 Ресурсосберегающие технологии. Экологическая безопасность технологических процессов.	3
Итого:	**54**

ТЕОРЕТИЧЕСКИЙ МАТЕРИАЛ

INTRODUCTORY COURSE

UNITE 1

Lexical-phonetic material

The basic rules of reading.

Основные правила чтения

Чтение гласных

Aa	[eɪ]	date, plane	Oo	[əʊ]	home, pole
	[æ]	man, flat		[ɒ]	dot, shop
Ee	[i:]	he, these	Uu	[ju:]	flute, student
	[e]	pencil, bell		[ʌ]	cup, luck
Ii	[aɪ]	time, tie	Yy	[aɪ]	cry, type
	[ɪ]	it, lift, lip		[ɪ]	myth, fifty

Чтение некоторых согласных

Cc	[k]	cap, colour, cut	Jj	[dʒ]	jump, jam
	[s]	centre, city cyder	Ss	[s]	son, seven
Gg	[dʒ]	gym, page, giant		[z]	close, rose
	[g]	game, goal, flag grass, guest	Xx	[ks]	axe, fox

Чтение некоторых буквосочетаний

ng	[ŋ]	ring, young, long	ou	[aʊ]	loud, house
	[ŋg]	angry, hungry	oy	[ɔɪ]	joy, toy, boy
nk	[ŋk]	bank, ink	oi		oil, point
ck	[k]	clock, rock	ay	[eɪ]	ray, play
wh	[w]	white, what	ai		paint, gain
gh	не читается	eight, high	ir	[ɜ:]	girl, firm
sh	[ʃ]	ship, shop, dish	er		her, term
ch	[tʃ]	chalk, bench	ur		turn, fur
th	[ð]	this, those	ar	[ɑ:]	far, party
	[θ]	thing, cloth	or	[ɔ:]	force, more portrait
ph	[f]	phone, photo	er	[ə]	speaker, writer
sch	[sk]	school, scheme	or		doctor
ee	[i:]	free, meet	ure	[jʊə]	pure, sure
ea		meat, tea, read	ow	[aʊ]	how, down
oo	[u:]	spoon, too		[əʊ]	show, snow
	[ʊ]	book, good	all	[ɔ:l]	call, ball, small
		исключения: flood, blood — [ʌ]	qu	[kw]	queen, quite

Таблица 1. Основные правила чтения

Terms of work with the dictionary

1. Открыть словарь на той букве, с которой начинается слово;
2. Открыть страницу, где начинается вторая буква слова;
3. Затем нужно искать по алфавиту третью букву и т.д.
4. Теперь нужно выяснить, какая часть речи вам нужна. Например, repeat может быть глаголом – значит, надо смотреть обозначение v (verb глагол); или существительным – тогда значения даются после обозначения n (noun существительное); именем прилагательным *a* (adjective): high [hai] *a* — высокий; наречием adv (adverb); местоимением pron (pronoun).
5. Необходимо учитывать, что слово может иметь много значений. Так, например, словарь проф. В.К.Мюллера дает пять значений для существительного repeat и семь значений для глагола repeat. Отбирайте в словаре подходящее по значению русское слово, исходя не только из грамматической функции английского слова, но из общего смысла переводимого предложения. Для того чтобы выбрать правильное значение слова в тексте, надо решить, какое из них соответствует контексту, откуда оно взято.
6. Если в словаре не будет подходящего для контекста русского значения слова, ваша задача, пользуясь данным в словаре общим значением английского слова, подобрать самостоятельно такое русское слово, которое более всего отвечает общей мысли данного предложения, характеру текста и строю русской речи. Например, в англо-русский словарь, содержащий около 60 тысяч слов, составленный В. К. Мюллером, не включено слово schooling, однако к слову school *v* даются значения: 1. приучать, 2. учить(ся) в школе. На основе общего контекста, связанного с обучением в школе переводим предложение; His formal schooling lasted for lour years.— Его обучение в средней школе формально продолжалось четыре года.

Lexical-grammar material

Verb forms

Tense	Affirmative Form	Interrogative Form	Negative Form	Examples
Present Simple	I/you/we/they work He/she work**s**	Do I/you/we/they work? Does he/she work?	I/you/we/they don't work He/she doesn't work	Every day we **work** at the college.
Present Continuous	I am working You/we/they are working He/she is working	Am I working? Are you/we/they working? Is he/she working?	I am not working You/we/they aren't working He/she isn't working	Alex **is working** now.
Present Perfect	I /you/we/they have worked He/she has worked	Have I/you/we/they worked? Has he/she worked?	I/you/we/they haven't worked He/she hasn't worked	I **have** just **worked** with my pupils.
Present Perfect Continuous	I/you/we/they have been working He/she has been working	Have I/you/we/they been working? Has he/she been working?	I/you/we/they haven't been working He/she hasn't been working	He **has been working** for two hours already.
Past Simple	I/you/he/she/we/they worked	Did I/you/he/she/we/they work?	I/you/he/she/we/they didn't work	I **worked** in the garden yesterday.
Past Continuous	I/he/she was working We/you/they were working	Was I/he/she working? Were we/you/they working?	I/he/she wasn't working We/you/they weren't working	Danila **was working** in the orchard when you called.
Past Perfect	I/you/he/she/we/they had worked	Had I/you/he/she/we/they worked?	I/you/he/she/we/they hadn't worked	She said that she **had worked** with John in the studio.
Past Perfect Continuous	I/you/he/she/we/they had been working	Had I/you/he/she/we/they been working?	I/you/he/she/we/they hadn't working	He **had been working** for an hour when I came.
Future Simple	I/you/he/she/we/they will work	Will I/you/he/she/we/they work?	I/you/he/she/we/they won't work	They **will work** tomorrow.
Future in the Past	I/you/he/she/we/they would work	Would I/you/he/she/we/they work?	I/you/he/she/we/they wouldn't work	She said that she **would work** the next day.
Future Perfect	I/you/he/she/we/they will have worked	Will I/you/he/she/we/they have worked?	I/you/he/she/we/they won't have worked	I will have worked with the article by noon.
Future Continuous	I/you/he/she/we/they will be working	Will I/you/he/she/we/they be working?	I/you/he/she/we/they won't be working	This time next Sunday we **will be working** with the article.
Future Perfect Continuous	I/you/he/she/we/they will have been working	Will I/you/he/she/we/they have been working?	I/you/he/she/we/they won't have been working	I will **have been working** with the article for a month when Tom joins me.

Таблица 2. Видовременные формы глагола.

Word order in a sentence

Порядок слов в утвердительном предложении				
Обстоятельство	Подлежащее (возможно с определением)	Сказуемое	Дополнение (возможно с определением)	Обстоятельство
Yesterday Вчера	*I* я	did сделал	my homework мое домашнее задание	___ ___
___ ___	My little brother Мой младший брат	is watching смотрит	cartoons мультики	now сейчас

Таблица 3. Порядок слов в утвердительном предложении.

Порядок слов в отрицательном предложении					
Обстоятельство	Подлежащее (возможно с определением)	Сказуемое		Дополнение (возможно с определением)	Обстоятельство
		Вспомогательный глагол + not	Основной глагол		
Yesterday Вчера	*I* я	didn’t не	do сделал	my homework мое домашнее задание	___ ___
___ ___	My little brother Мой младший брат	isn’t не	watching смотрит	cartoons мультики	now сейчас

Таблица 4. Порядок слов в отрицательном предложении.

Порядок слов в вопросительном предложении				
Вспомогательный глагол	Подлежащее (возможно с определением	Основной глагол	Дополнение (возможно с определением)	Обстоятельство
Did ———	*I* *Я*	do сделал	my homework мое домашнее задание	yesterday? вчера?
Is ___	My little brother Мой младший брат	watching смотрит	cartoons мультики	now? сейчас?

Таблица 5. Порядок слов в вопросительном предложении

Category of nouns

Образование множественного числа имен существительных

Имена существительные образуют множественное число путем бавления к форме единственного числа окончания -s, которое произносится как [z] после звонких согласных и после гласных и как [s] после глухих согласных:

Room – rooms [rumz]
pencil- pencils ['pensilz]
book - books [buks]
map - maps [maps]

Имена существительные, оканчивающиеся в единственном числе на -ss, -x, -sh, -ch, т.е. оканчивающиеся на свистящий или шипящий звук, образуют множественное число путем прибавления окончания -es к форме единственного числа. Окончание -es произносится как [iz]:

class - classes ['kla:siz]
box - boxes ['boksiz]

Имена существительные, оканчивающиеся в единственном числе на -y с предшествующей согласной, образуют множественное число путем прибавления окончания -es, причем **y** меняется на **i**:

city - cities
army - armies
factory - factories

Если же перед **y** стоит гласная, то множественное число образуется по общему правилу путем прибавления -s. И этом случае **y** не меняется на i:

day - days

boy - boys

toy - toys

key - keys

Имена существительные, оканчивающиеся в единственном числе на -o, образуют множественное число путем прибавления -es:

cargo - cargoes

hero - heroes

tomato - tomatoes

Существительные piano и photo образуют множественное число по общему правилу, принимая окончание -s: pianos, photos.

Имена существительные, оканчивающиеся в единственном числе на -f, образуют множественное число путем изменения f на v и прибавления окончания -es:

leaf – leaves

wolf - wolves

Имена существительные, оканчивающиеся на -fe, образуют множественное число путем изменения f на v и прибавления окончания -s:

knife – knives

wife - wives

Однако некоторые существительные, оканчивающиеся на -f и -fe, образуют множественное число только путем прибавления окончания -s:

chief - chiefs

handkerchief - handkerchiefs

roof - roofs

safe - safes

Существительное wharf пристань имеет две формы множественного числа: wharfs, wharves.

Degrees of comparison of adjectives

В английском языке, как и в русском, имена прилагательные образуют две степени сравнения: сравнительную (the Comparative Degree) и превосходную (the Superlative Degree). Имена прилагательные в положительной степени (the Positive Degree) обозначают качество предмета

без сравнения с этим качеством в других предметах: The Dnieper is a long river (long — Днепр — длинная река. положительная степень). The Volga is longer than the Dnieper Волга длиннее Днепра. (longer — сравнительная степень). The Volga is the longest river in Europe Волга — самая длинная река в Евроре (longest — превосходная степень).

Сравнительная степень односложных прилагательных образуется путем прибавления к форме прилагательного в положительной степени

суффикса -ег, а превосходна я степень — путем прибавления суффикса -est (простые формы степеней сравнения):

Положительная степень: sharp - острый, cold -холодный, deep - глубокий, strong – сильный.

Сравнительная степень: sharper более острый, острее,

colder более холодный, холоднее,

deeper более глубокий, глубже,

stronger более сильный, сильнее

Превосходная степень:

sharpest самый острый, острейший,

coldest самый холодный, холоднейший

deepest самый глубокий, глубочайший

strongest самый сильный, сильнейший

По этому же способу образуются степени сравнения двусложных прилагательных, оканчивающихся на -у, а также и некоторых других дву сложных прилагательных

Положительная степень:

busy занятый

easy легкий

dirty грязный

clever умный

polite вежливый

severe строгий

simple простой

Сравнительная степень:

busier более занятый,

easier , более легкий, легче

dirtier более грязный, грязнее

cleverer более умный, умнее

politer более вежливый, вежливее

severer более строгий, строже

simpler более простой, проще

Превосходная степень:

busiest самый занятый

easiest самый легкий, легчайший

dirtiest самый грязный, грязнейший

cleverest самый умный, умнейший

politest самый вежливый

severest самый строгий, строжайший

simplest самый простой, простейший

При образовании степеней сравнения посредством суффиксов -er и est соблюдаются следующие правила орфографии:

1. Если прилагательное оканчивается на немое e, то при прибавлении немое e опускается:

large большой larg-er larg-est

brave храбрый brav-er brav-est

ripe зрелый rip-er rip-est

2. Если прилагательное оканчивается на согласную, перед которой стоит одна гласная, то в сравнительной и превосходной степени конечная согласная удваивается :

big большой bigger biggest

hot горячий hotter hottest

thin тонкий thinner thinnest

wet мокрый wetter wettest

3. Если прилагательное оканчивается на -y с предшествующей согласной, то в сравнительной и превосходной степени y переходит в i:

busy занятый busier busiest

easy легкий easier easiest

dirty грязный dirtier dirtiest

dry сухой drier driest

Если перед y стоит гласная , то y остается без изменения:

gay веселый gayer gayest

Сравнительная степень большинства двухсложных прилагательных, а также прилагательных, состоящих из трех или более слогов, образуется при помощи слова more, а превосходная — при помощи слова most. Эти слова ставятся перед прилагательным в форме положительной степени (сложные формы степеней сравнения):

Положительная степень

active активный
famous знаменитый
difficult трудный
comfortable удобный
interesting интересный

Сравнительная степень

more active более активный, активнее
more famous более знаменитый
more difficult более трудный, труднее
more comfortable более удобный, удобнее
more interesting более интересный, интереснее

Превосходная степень

most active самый активный
most famous самый знаменитый
most difficult самый трудный, труднейший
most comfortable самый удобный
most interesting самый интересный, интереснейший

Степени сравнения некоторых прилагательных в английском языке образуются от другого корня:

good better best
bad worse worst
little less least
much more most
many more most

Для выражения меньшей или самой малой степени качества в предмете по сравнению с другими предметами употребляются соответственно слова less менее и least наименее, которые ставятся перед прилагательным в форме положительной степени: pleasant приятный, less pleasant менее приятный, least pleasant наименее приятный; comfortable удобный, less comfortable менее удобный, least comfortable наименее удобный.

При сравнении двух предметов одинакового качества прилагательное в положительной степени ставится между as ... as со значением такой же ... как, так же ... как: He is as young as my brother. Он такой же молодой (так же молод), как мой брат. My dictionary is as good as yours. Мой словарь такой же хороший, как ваш. В отрицательны х предложениях первое as часто

заменяется so: He is not so (as) young as my brother. Он не так молод, как мой брат.

Со значением **чем … тем …** употребляется сравнительный оборот The + (сравнительная степень) …, the + (сравнительная степень):

The easier the exam, **the higher** your marks will be.

The earlier you start, **the sooner** you will finish.

The older I get **the more forgetful** I become

Degrees of comparison of adjectives

Таблица 6. Степени сравнения прилагательных.

MAIN COURSE

UNIT 2

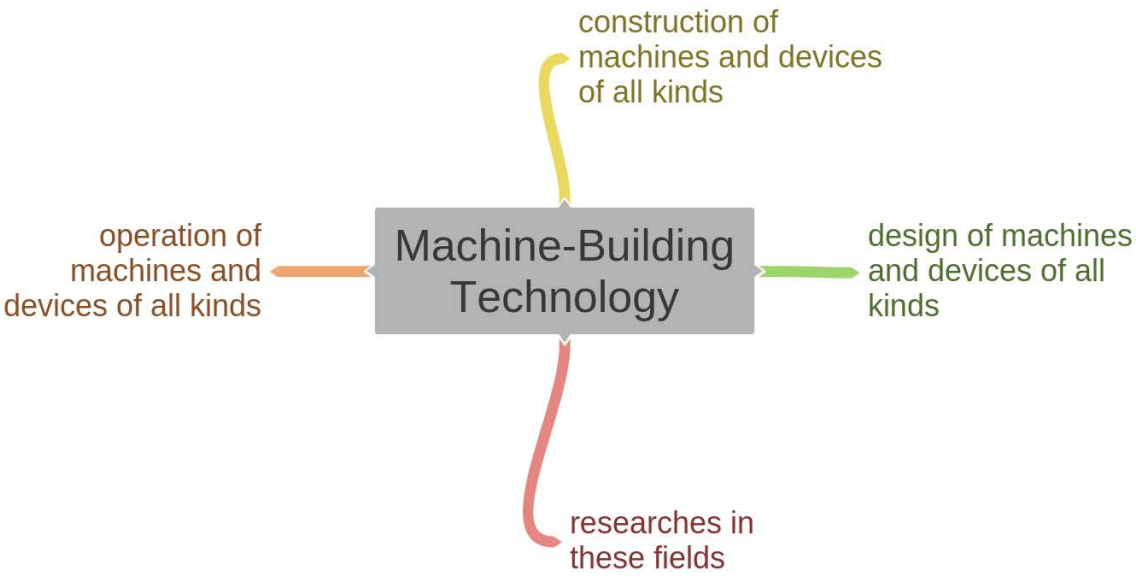


Схема 1. Содержкание технологии машиностроения.

UNIT 3

Mechanical Technician CV Sample

/Peter Johns/20 Any Road, Any Town/01209 1234134/pete-b-johns@anyemail.com

Professional Summary

A fully qualified mechanical technician, I have been employed for a number of companies to provide a professional level of work either in-house or for clients. I am experienced with all aspects of mechanical works, including repairs to engines, pumps and escalator systems. I am also well-versed with drawing up plans for new systems using common computer aided design (CAD) software packages. Familiar with installing and maintaining industrial plant equipment, I have also made parts for certain systems where replacements could not be ordered. I am a meticulous worker with a passion for problem solving and for making things work better. I am now seeking a new role with more responsibilities in order to make progress with my career.

Core Qualifications

(NVQ) Diploma in Mechanical Manufacturing Engineering, Level 3

Professional Qualifications

- Level 2 Certificate in Mechanical Engineering
- Member of the Institution of Mechanical Engineers
- Trained in drives, valves and pumps (SEMTA)

Academic Qualifications

City and Guilds in Engineering Skills (1155) 5 good passes at GCSE - Maths, English, Technology, Art and Science

Key Skills

- Fully skilled with repairing mechanical parts on railway signalling equipment.
- Knowledgeable with inspecting and repairing building systems, such as lifts and escalators.
- Able to take an orderly approach with overcoming both machinery and process problems and work with others to resolve issues effectively.

Work Experience

Rail Mechanical Technician – Manchester, May 2009 - Present

- Responsible for overseeing planned maintenance inspections of signalling equipment over weekend shifts.
- Developed new inspection processes to speed work up whilst ensuring works complied with railway health and safety legislation.
- Trained several junior members of the team to keep records of servicing up to date and to validate repairs.

Field Mechanical Technician – Bolton, February 2002 – April 2008

- Responsible for on-site inspections of all sorts of plant in the north west of England, planning works in the most cost effective way.
- Serviced highly advanced equipment, such as robotic machinery being used on paint production lines.
- Wrote reports and customer feedback on both computer and paper, producing technical drawings when necessary.

References

References available on request.

Conclusion

This mechanical technician CV sample affords many crucial ideas into the best way of creating a new CV, but it is only one of many. You can discover further help in the tools and CV builder, also located on this site.

UNIT 4

Equipment and materials

Universal tools

pincers (клещи)	handsaw (ножовка, ручная пила)	spanner (гаечный ключ)	drill (сверло)
chisel (резец, долото)	pliers **(**плоскогубцы**)**	screwdriver (отвертка)	Hammer (молоток)
hacksaw (ножовка)	Bench-shears (верстачные ножницы)	pipe-cutters (труборез)	alligator shears (механические ножницы)

Таблица 7. Универсальные инструменты.

Machine-cutting tools. Cutters

File - напильник; надфиль

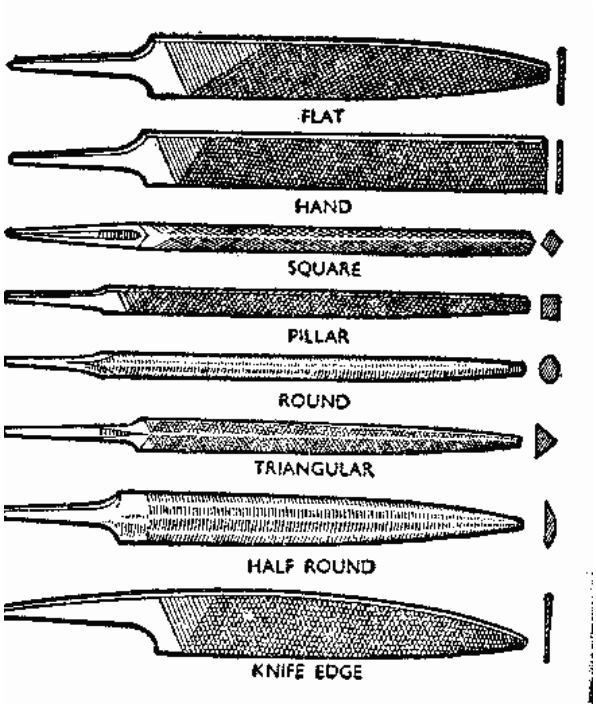


Рис.1. Типы напильника.

Cutter - режущий инструмент
Knife- резец, скребок, струг
Graver - гравировальный резец для проведения тонких линий, поворотный гравировальный резец; шарнирный гравировальный резец
Bit - бит, долото
Glasscutter – стеклорез
Incisor- резец
Nipper - плоскогубцы, кусачки, щипцы
Burin- резец гравёра, грабштихель
Chisel - резец, долото

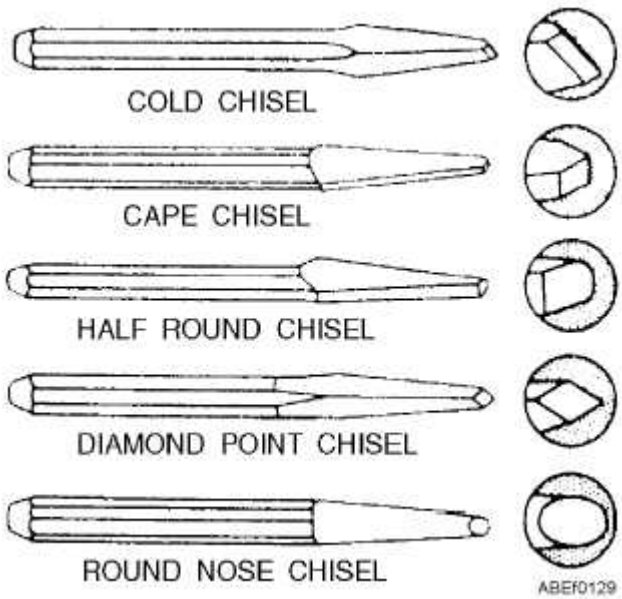


Рис.2. Типы долото

UNIT 5

Engineering materials. Alloys

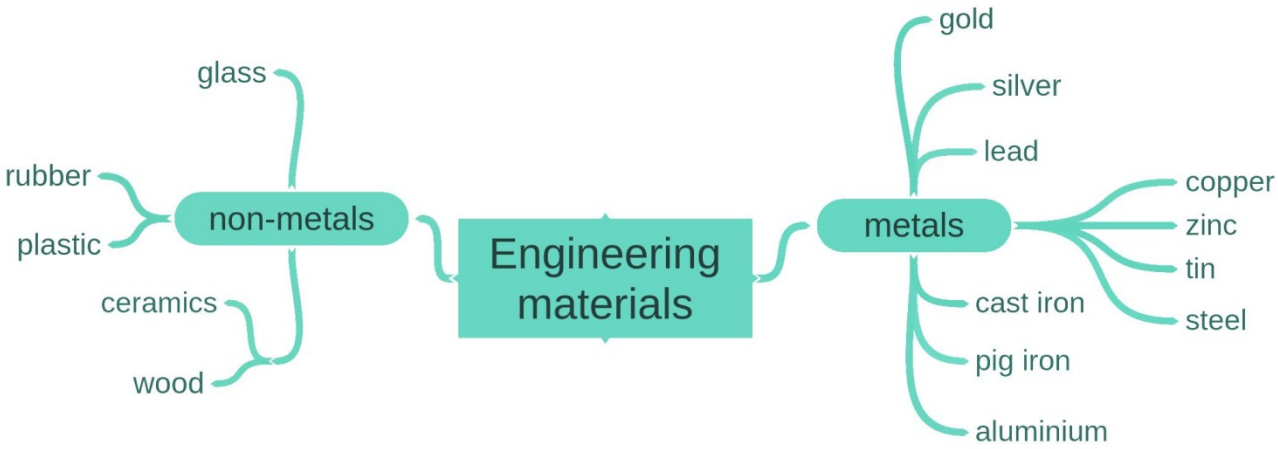


Схема 2. Классификация инженерных материалов.

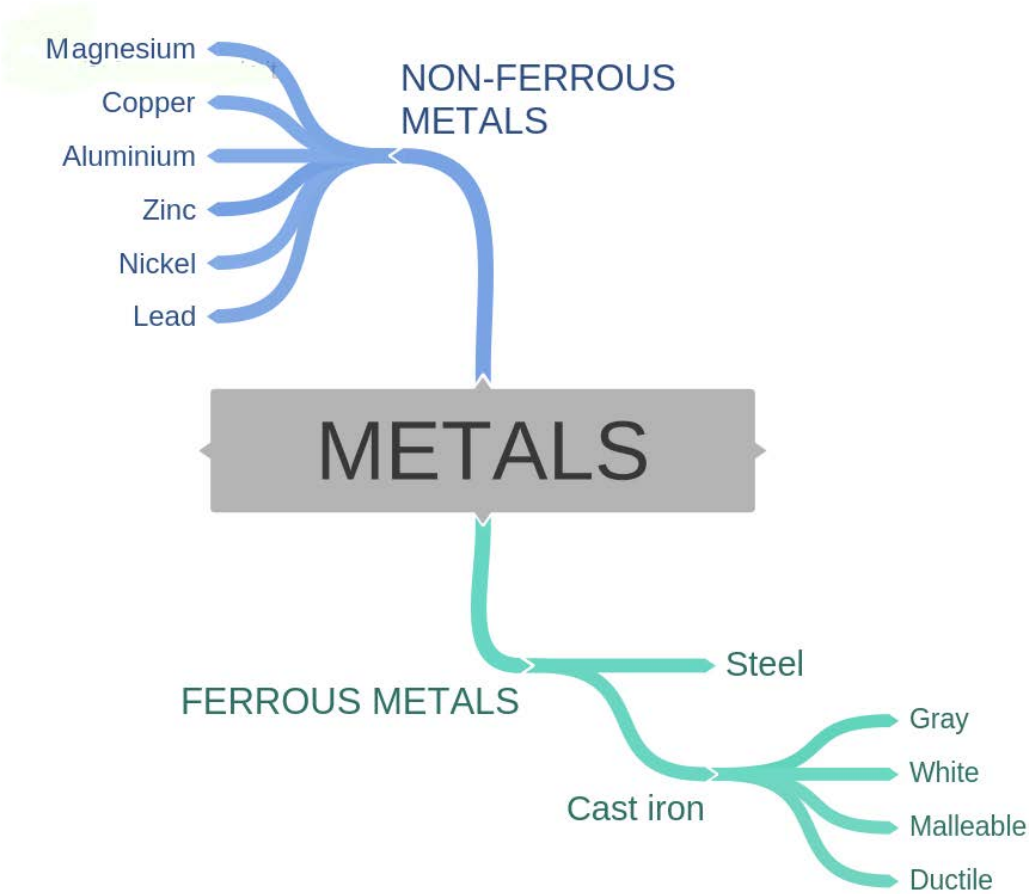


Схема 3. Классификация металлов

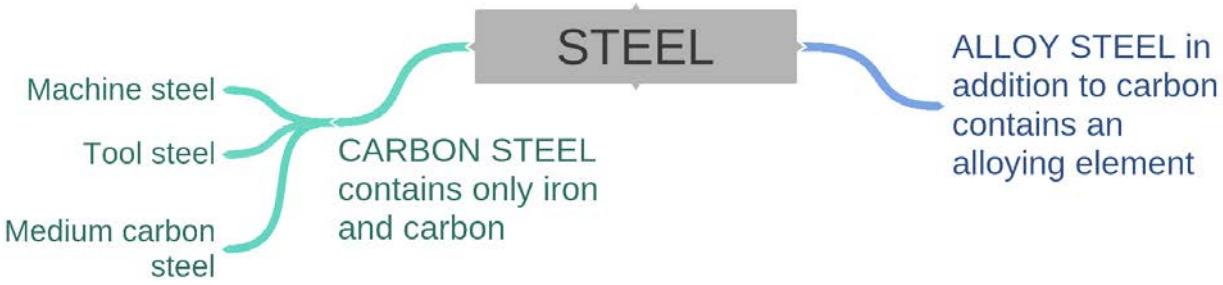


Схема 4. Классификация сталей по химическому составу

UNIT 6

Machine-Tools

Milling machines

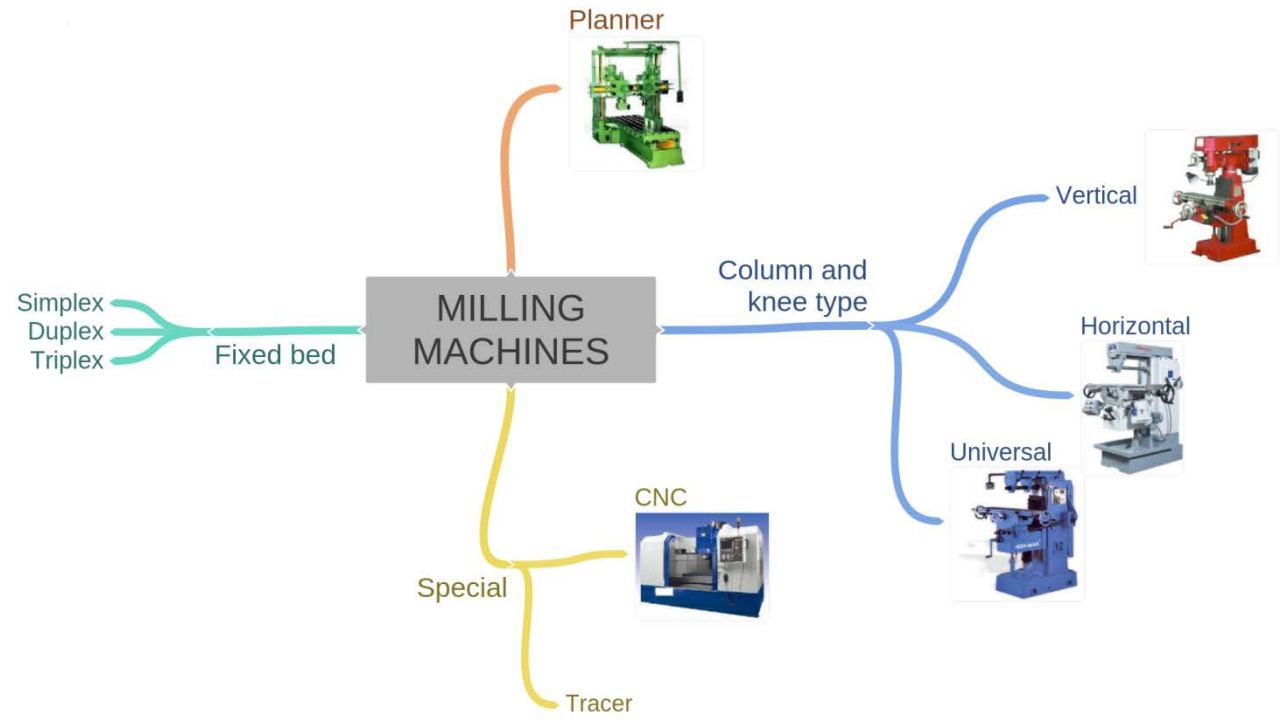


Схема 5. Классификация фрезерных станков.

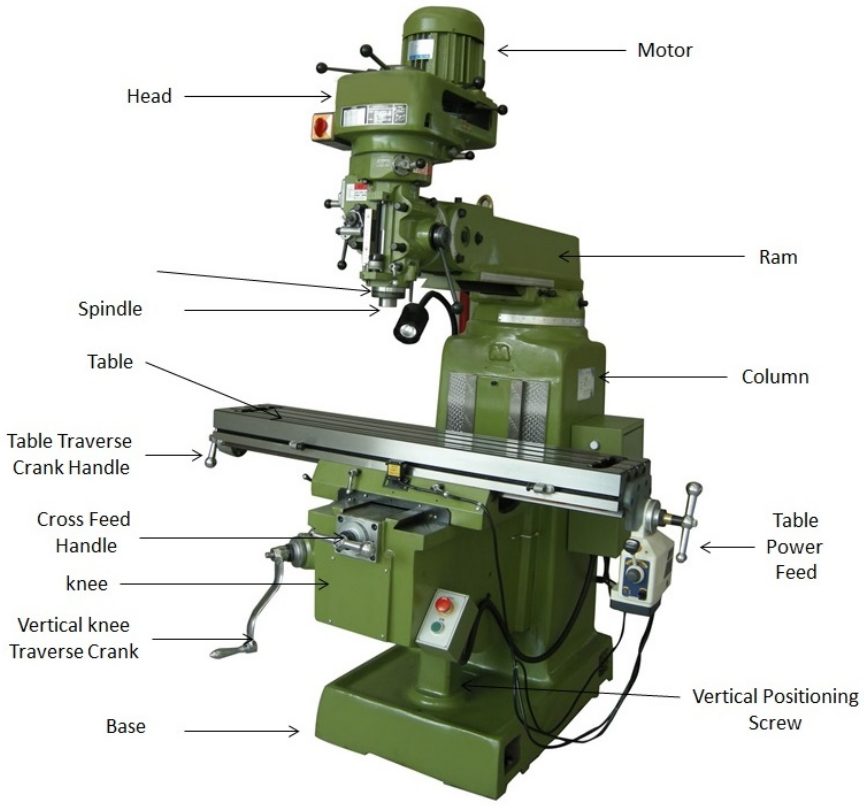


Рис.3. Устройство фрезерного станка.

Grinding machines

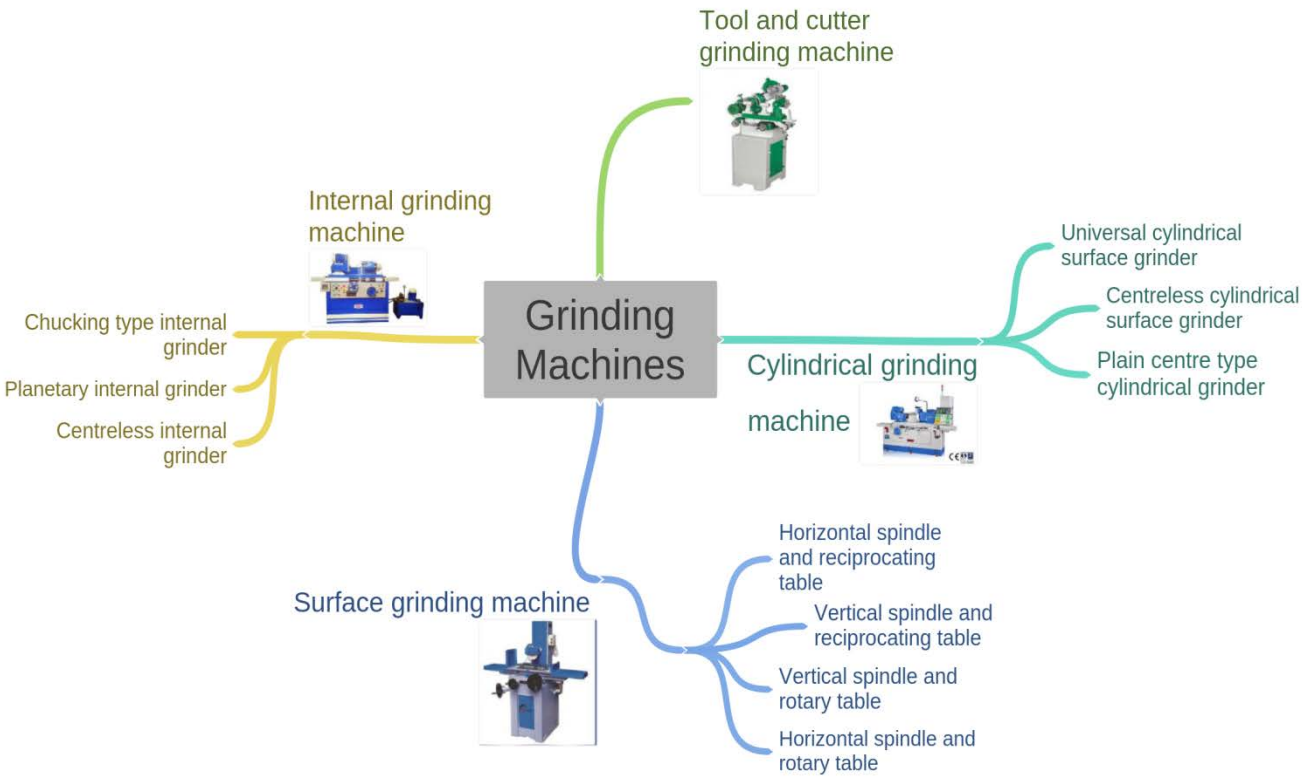


Схема 6. Классификация шлифовальных станков

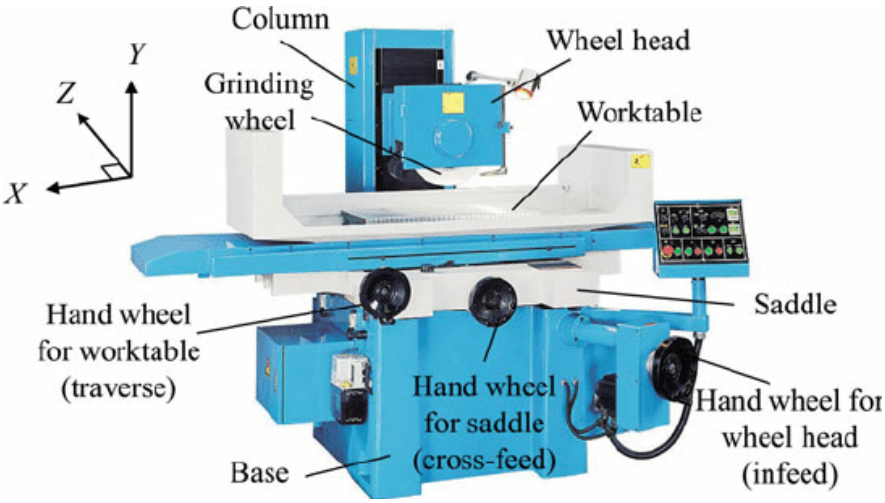


Рис.4. Устройство шлифовального станка

Lathe machines

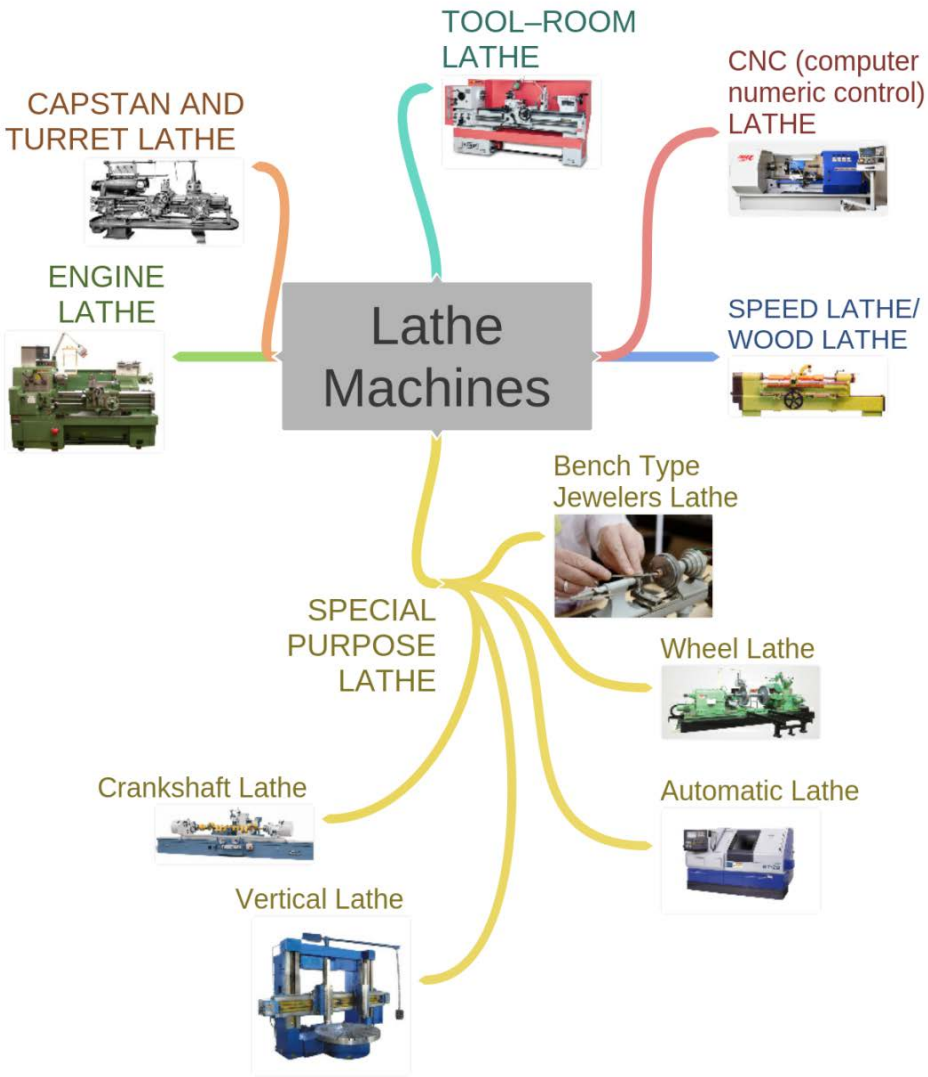
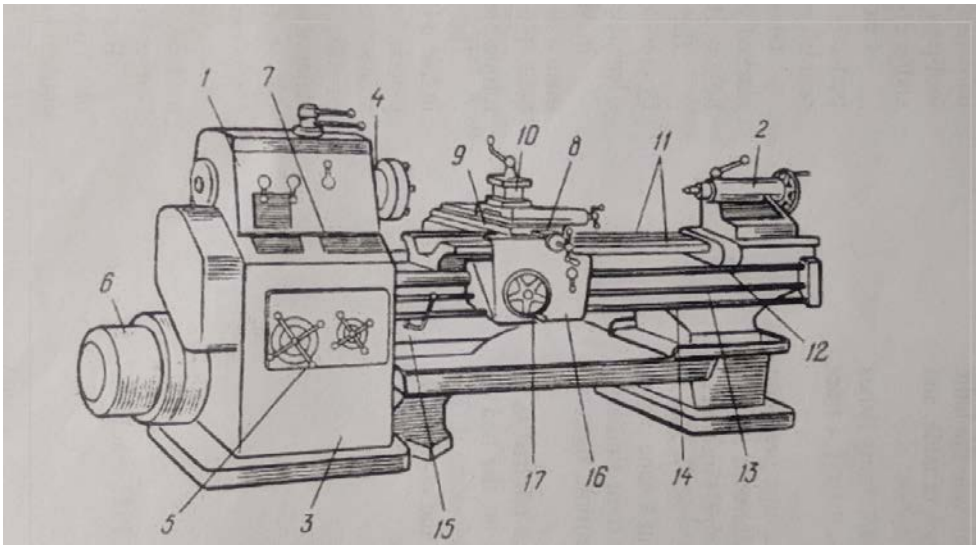


Схема 7. Классификация токарных станков и их применение



1. gearbox and headstock; 2 tailstock; 3. frame; 4 spindle; 5 feed gearbox; 6. electric motor; 7. control panel; 8. Cross slide; 9. carriage;10. tool block; 11. ways; 12. lead screw; 13. feed rod; 14. operating ' level shaft; 15. operation and reverse handle; 16. apron; 17. hand feed wheel

Рис.5. Устройство токарного станка

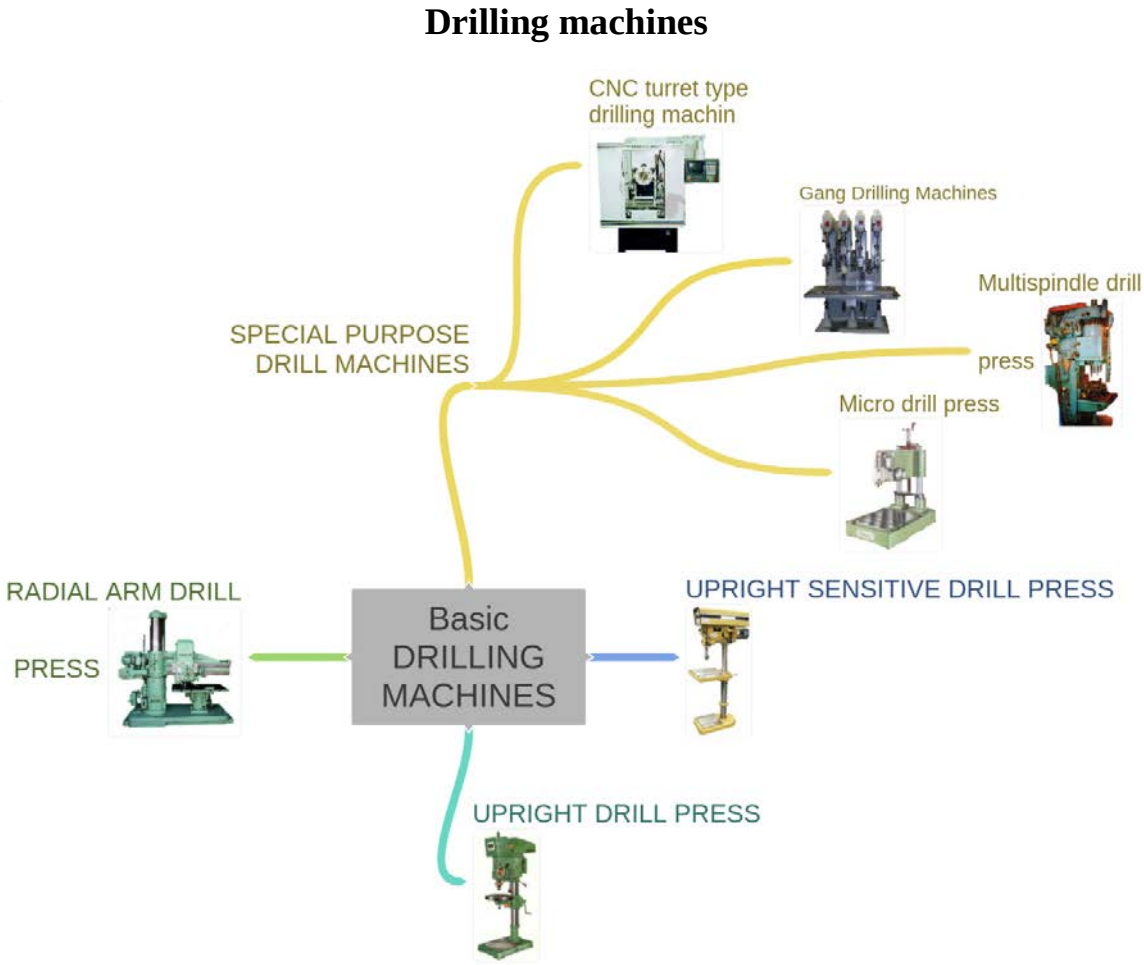


Схема 8. Классификация сверлильных станков

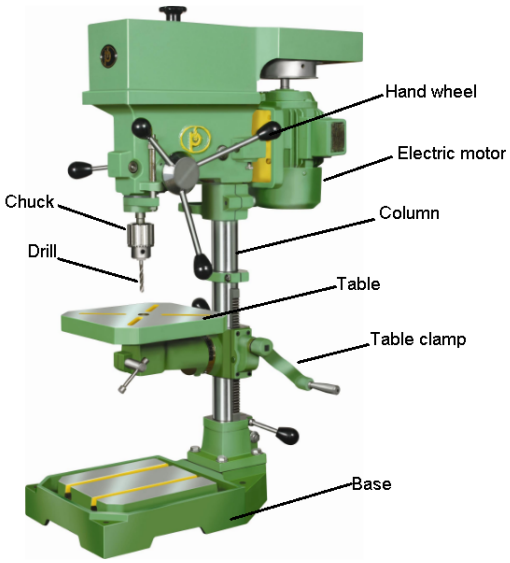


Рис.6. Устройство сверлильного станка

UNIT 7

Manufacturing and Technological Processes

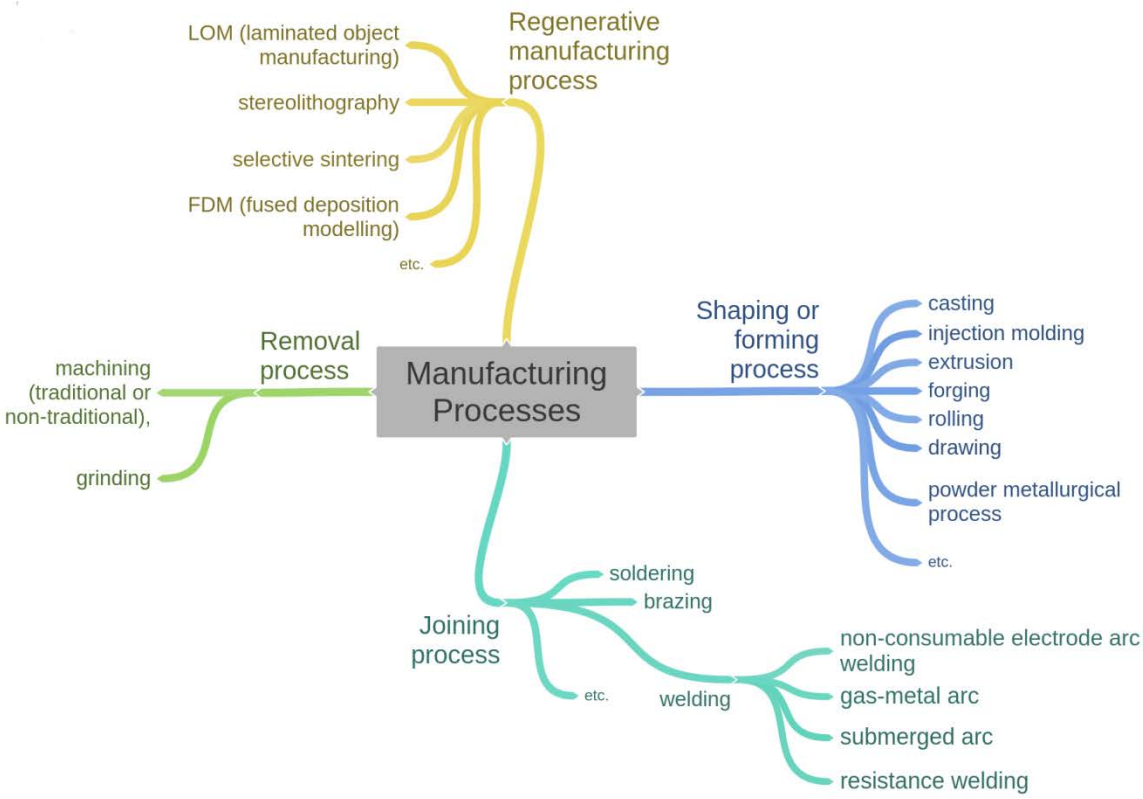


Схема 9. Классификация производственных процессов

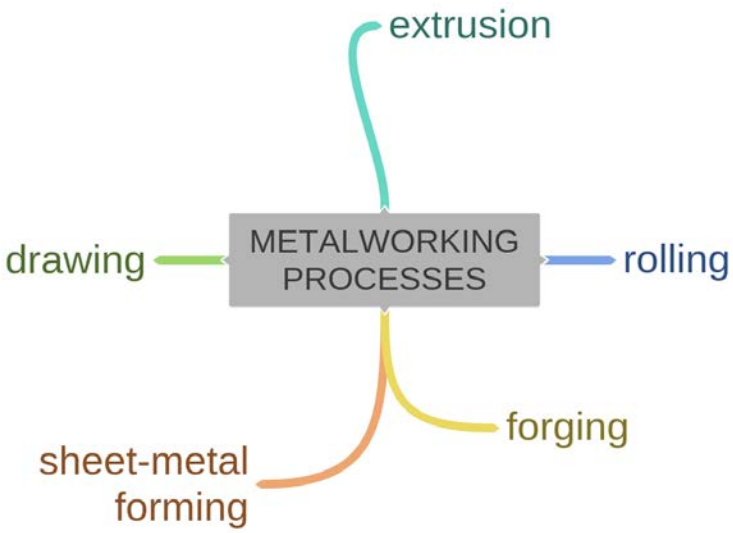


Рис.1. Основные процессы металлообработки

ПРАКТИЧЕСКИЙ МАТЕРИАЛ

INTRODUCTORY COURSE

Learning foreign languages

Exercise 1. Read the lines of words with the same sound in the stressed syllable.
[ʌ] number, culture, study, subject, among, just, funds, must

[ai] nice, find, science, kind, right, bike, pile

[I] sit, citizen, different, think, English, business, with

[i:] read, need, teacher, teeth, reason, people, means

Exercise 2. Say what possibilities foreign languages give us: a) for communication; b) for studies; c) for travelling and recreation; d) other possibilities.

Exercise 3. Read the text and say if you consider foreign languages to be important for professional activity.

At school or college we are to study a number of subjects. There has to be a foreign language among them and your teacher assures you that it is completely essential to discover it. So you sit there, getting your teeth into several dictionaries and workbooks with the only question in your mind: “What for?” There are a number of reasons to learn a foreign language. Firstly, it is a well-recognized reality that by learning a new foreign language we get acquainted with new cultures. So this is a way to become more intelligent and to learn much more interesting facts. If you are not interested in learning new cultures, you may fi nd other reasons to study foreign languages. For example, you travel abroad to have a nice rest, let’s say to New York, and you can’t anticipate every citizen to know Russian. English is an international language, no doubt about that. People from different countries learn English and visit foreign English-speaking countries to fi nd success in their future enterprise. Just think about possibilities for your career growth if you are a free foreign language user. Some people earn 9 fairly good funds translating various English books, essays and articles into their native language. If your business is involved in international affairs, you must know at least the bases of the partner’s language to discover a typical ground with your foreign co-workers.

A modern engineer or even a worker can't work with an imported instrument or a machine if he/she isn't able to read the instruction how to work. Ordinary people need language to translate instructions or manuals to washing machines, vacuum cleaners or even food products. English is the language of progressive science and technology, trade and business. It is the language of international aviation. It is also a major language of diplomacy. Hundreds of books, magazines and newspapers are printed in English. People learn languages when they have opportunities to understand and work with language in a context that they comprehend and find interesting. In this view, ESP (English for Special Purposes) is a powerful means for such opportunities. Studying English students work with material which they find interesting and relevant and which they can use in their professional work or further studies. Students are shown how the subject-matter content is expressed in English. Learners in the ESP classes are generally aware of the purposes for which they will need to use English. Having already oriented their education toward a specific field, they see their English training as complementing this orientation.

Exercise 4. Find in the text given above antonyms to the words and word combinations.
Native tongue, answer, failure, unable, outstanding, powerless, General English.

Exercise 5. Mark the sentences below as True or False.
1. By learning a new foreign language we get acquainted with new cultures. 2. Learning a foreign language isn't a compulsory component of the college curriculum. 3. Ordinary people don't need foreign languages. 4. English is the language of progressive science and technology, trade and business.

Exercise 6. Correct mistakes in the underlined words in the sentences given below and write down the right sentences.
1. At school or college we are to study the few subjects. 2. If you are not interested in learning new cultures, you may find other reasons to study foreign languages. 3. Hundreds of books are printed in English. 4. ESP is a powerful mean for such opportunities. 5. Students are shown how it is expressed in English.

Exercise 7. Think of the possibilities for your professional and career growth that the foreign language knowledge opens. Make up a list of such possibilities. Compare it with your partner's list. Discuss the lists, agreeing, adding details or criticizing. You may use the following word combinations:

• to read books, essays and articles, magazines and newspapers on profession
• to read technical instructions and other documents

• to find the necessary information on the profession on the Internet
• to establish professional contacts

Exercise 8. Which of the following forms of the language activity help to enable a person to use the English language in his/her professional activity? Add your own variants:
• reading texts on profession, analysing information from the texts
• learning professional terms in English
• reading technical documents in English
• writing CVs
• looking for the information of professional character on the Internet
• making up dialogues on professional themes

Exercise 9. Do you agree that learners in the ESP classes are generally aware of the purposes for which they will need to use English? Give some arguments.

UNIT 1

Методическое обеспечение:

1. Видеофрагмент «The basic rules of reading».
2. Опорный конспект «The basic rules of reading».
3. Опорный конспект «Terms of work with the dictionary».
4. Опорный конспект «Verb forms».
5. Опорный конспект «Word order in a sentence».
6. Опорный конспект «Degrees of comparison of adjectives»
7. Задания для самоконтроля.

Lexical-phonetic practice

Read the words.

1. pale, plate, name, take, table, made, behave, gate, tale
2. hot, dog,ox, fond, clock, fog, pole, hole, sole, noble, joke
3. ore, bore, more, before, adore, ignore, tore, wore, restore.
4. rub, fun, hunt, just, jump, tulip, duke, Tuesday, tube, mute, student
5. me, he, these, even, perch, verse, berth, egg, bed, red, net
6. circle, bird, dirty, wire, desire, fine, rise, drive, sit, is, lip, six
7. my, fly, myth, Syd, physics, myrrh, pyre.

Lexical-grammar practice

Exercise 1. Read the words and define what words they are formed from. Translate the words.

Underground, flowery, certainly, highly, talker, motherhood, summary, conversation, friendship.

Exercise 2. Make up questions to which the following sentences will be answers.

1. He plays football twice a week. 2. She is learning a poem. 3. We keep our car in the garage. 4. I helped my mother about the house yesterday. 5. She does her shopping with her friend every week. 6. We go to the University by metro.

Exercise 3. Agree or disagree.

1. You will go to school next year. – Yes, I .../No, I ... . 2. Your father can drive a car. – Yes, he .../No, he ... . 3. It often rained last autumn. – Yes, it .../No, it ... . 4. Your parents have painted the fl oor in your room. – Yes, they ... /No, they ... . 5. Your granny is coming to see you next week. – Yes, she .../No, she ... . 6. Shall you meet her at the station? – Yes, I .../No, I ... .

Exercise 4. Complete the sentences with the suitable word.

1. It isn't your hat. It's … . a) my b) mine c) of me 2. I like climbing. … do I. a) neither b) either c) so 3. The TV's too loud. Turn it … . a) on b) of c) off 4. How … are the peaches? a) many b) much c) little 5. We've got English … Monday morning. a) in b) at c) on 6. Have … more crisps, please. a) some b) a c) an 17

Exercise 5. Put the words in the correct order to make sentences.

1. what, like, today, weather, is, the?
2. are, new, the, her, in, bag, clothes.
3. practising, dance, we, a, are, new, disco, moment, the, at.
4. yesterday, you, at, where, o'clock, were, six, evening?
5. young, cinema, children, too, to, the, into, were, get, the.

Exercise 6. Put in prepositions where necessary.

We are students and we share a flat. The flat is … a block … flats … the centre … Minsk. It is … the second floor. There are tree rooms … our flat. My friends like playing … chess. Yesterday he played chess … six … the evening and only got … bed … ten. My best friend lives … the country and he likes it very much. His house is a long way … our college. He goes … town every morning. He is always … time … classes. We are having an exam … the 2nd … June. That's why we are reading … the exam at the moment.

Exercise 7. Rewrite in a different way.
1. What’s your occupation? What ... ?
2. Don’t park your car in this place! You ... .
3. Have you got much traffic in your town? Is ... ?
4. They haven’t many motorways so far. There ... ?
5. This girl is so pretty! What ... !
6. How exciting these fairy-tales are! Aren’t ... ?

Exercise 8. Complete the dialogue, in which you give some information to your teacher. Role-play the dialogue.

Teacher: Where do you live?
You: ...
Teacher: Well, how old are you?
You: ...
Teacher: What school did you finish?
You: ... 18
Teacher: What’s your hobby?
You: ...
Teacher: Have you got any friends at the college?
You: ...
Teacher: How do you spend your spare time?
You: ...
Teacher: Do you like our college?
You: ...
Teacher: What are your plans for the future?
You: ...
Teacher: I wish you to realize your plans.

Exercise 9. Write these sentences correctly by separating the words and adding the punctuation marks and the capital letters.
1.mozartwasafamousaustriancomposerwholivedintheeighteenthcentury
2.whenstevelookedatthephotographhewasastonished
3.lastsundaytheweatherwasawfulitrainedthewholedayandwestayedathomeandwatchedthefilm

Exercise 10. Correct the mistakes. 1. Some of my friends is coming to visit me. 2. Who want to answer the question? 3. They are going to have a dinner first. 4. How many time did it take you to get there? 5. There is still very dark outside. 6. It raining heavily now.

Exercise 11. Use the right form of the verbs in brackets.

1. Nurses (look) after patients in hospitals. 2. Ann plays the piano, but she (not, play) it very well. 3. In Britain most shops (close) at 5.30 p.m. 4. At night when it (get) dark, they (switch) on the TV or the radio and (listen) to music. 5. I (learn) to drive a car some years ago. 6. He (cross) the street and (go) towards the city park. 7. As soon as you (come) home, I'll phone you. 8. If you (enter) the Institute, your parents will be happy. 9. If it (rain) we shall stay at home. 10. My teacher (speak) over the telephone now. 11. Where is Ann? – She (play) tennis. 12. We (ski) the whole day yesterday. 13. What you (discuss) at the meeting yesterday? 14. It is a very boring novel. I (read) it for two weeks, though I usually (read) books quickly. 15. She (live) in Gomel since she (be) born. 16. The children (skate) in the park for two hours before they went to the cinema. 17. We (lie) on the beach since early morning. 18. She (learn) English for 5 years before she goes abroad.

Exercise 12. Write the plural form of the following.

A regular nouns
story, play, glass, flag, photo, name, match, knife, bush, chief, page, radio, roof, prize, set, key, factory, wolf, piano, class, cup, city
B irregular nouns
child, goose, man, foot, mouse, woman, sheep, person, deer, tooth, ox
C nouns of Greek or Latin origin
criterion, datum, formula, crisis, stimulus, index, phenomenon, medium, oasis, nucleus, memorandum, basis, radius, analysis, symposium, hypothesis
D compound nouns
fellow-worker, merry-go-round, man-of-war, passer-by, sister-in-law, forget-me-not, room-mate, lily-of-the-valley, ticket-holder, commander-in-chief, governor-general

Exercise 13. Divide the following words into two columns: countable and uncountable nouns (you must get 25 uncountable nouns).

furniture, coffee, leaf, food, computer, list, blood, job, work, language, country, advice, information, money, progress, permit, permission, baggage, luggage, beach, traffic, weather, window, knowledge, air, water, holiday, damage, accommodation, scenery, scene, pigeon, bread, mountain, kick, news, accident, laugh, flour, laughter

Exercise 14. Translate the following sentences into Russian paying attention to the words in bold type.

1. The windows in his car are made of unbreakable glass. 2. He gave me a glass of water. 3. These are the works of Shakespeare. 4. He is not at home, he is at the works. He is installing new equipment. 5. His work is rather dull,he thinks. 6. Do you have scales? I want to weigh this fish. 7. Celsius or Fahrenheit scales are used in many countries. 8.1 spilled the water, give me a cloth, please. 9. Have you bought cloth for draperies? 10. He's got his car insurance police. 11. She always criticizes the government's policy. 12.1 need an iron to press my dress. 13. These items are made of iron. 14. There is neither salt nor pepper on the table. 15. He planted several peppers in the hothouse. 16. Would you like some chocolate? 17. She took aehowlate out of the box. 18. He meets a lot of people every day. 19. A lot of different peoples live in Asia. 20. They run a very profitablebHsiness somewhere in South Africa. 21. Business is an essential part of American life.

Exercise 15. Put the following into the correct order.

1) suede / Italian / new / red / soft / shoes 2) elderly / tall / Englishman 3) oval / Venetian / ancient / valuable / glass 4) shiny / large / expensive / brown / leather / case 5) square / wooden / old / nice / table 6) modern / stone / large / beautiful / cottage 7) porcelain / tea / blue / thin / old / cup 8) young / blonde / handsome / tall / man 9) old / several / English / beautiful / castles 10) pretty / French / young / a lot of / girls 11) dark blue / best / silk / my / shirt 12) young / many / factory / German / workers

Exercise 16. Choose the right word.

1. I don't like horror films. I think they are (frightening/frightened) and (boring/bored). 2. Don't look so (surprising/surprised). Of course, it war a (surprising/surprised) decision but we had no other out. 3. It was a (tiring/tired) journey. I wish I hadn't it. I feel completely (exhausting/exhausted) aftes 4. The football match was (disappointing/disappointed). Our team lost the game and we left the stadium qtiite (disappointing/disappointed). 5. He can't remember his pupils' names. It seemed funny at first, but now it is rather (embarrassing/embarrassed). 6. So far as Mrs. Brown was concerned she did not seem to be in the least (embarrassing/embarrassed). 7. He did not come and she 'looked rather (worrying/worried). 8. The rise in crime is (depressing/depressed). 9. The pictures made a (depressing/depressed) impression on him. 10. She is not (satisfying/satisfied) with her position.

Exercise 17. Complete the sentences with the words from the box using the proper degree.

Busy few famous convenient well-read kind-hearted straight hot

1. She is easy to deal with. I think she is___than her sister. 2.1 suppose the works of this artist are___ abroad than in his country. 3. This armchair is___of all. 4. He knows a lot. He is___than his schoolmates. 5. Let's take this path. It's___. 6. The street you live in is___than mine. 7. Days are getting___in July. 8, He made___mistakes in his class.

Exercise 18. Open the brackets and use the comparative form of the adjectives and adverbs.

1. This exercise is (simple) than that one. 2. Why are you talking? Please be (quiet). 3. New districts of Moscow are (beautiful) than the old ones. 4. He is (clever) than his brother. 5. My (old) sister is 4 years (old) than me. 6. There are (many) customers on Saturdays than on weekdays. 7. Are expensive things (good) than cheap ones? 8. Is English grammar (difficult) than Russian grammar? 9. He has made (few) mistakes than yesterday. 10. She had to give us (far) information though she didn't want to. 11. Students from Group 3 are (industrious) than those from Group 1.12. Нал с you met our new colleagues, Mr Brown, and Mr. Green? The former is an excellent economist, (late) is a good lawyer. 13. They have got down to business without any (far) delay. 14. This matter is (urgent) than that one. 15. He plays tennis (bad) than she. 16. He's got a still (old) edition ef this book. 17. Is there a (late) train passing here? 18. (far) details will be given tomorrow. 19. Sparrows are (сопшюъ) than any other birds. 20. Motor-cycles are (noisy) than cars, aren't they?

Exercise 19. Choose the right variant.

1. Martin was the (more talented/most talented) of the two brothers. 2. Of the three shirts I like the blue one (better/best). 3. My dog is the (prettier/prettiest) of the two. 4. This summary is the (better/best) of the two presented. 5. There are nine planets in our solar system and Pluto is the (farther/farthest). 6. Mary is the (tallest/ taller) of the two girls. 7. The boss likes my plan (better/ best) of the two. 8. This is the (less difficult/least difficult) of the four cases. 9. This knife is the (sharpest/ sharper) of the two. 10. Mother was the (more/most) beautiful of seven daughters.

Exercise 20. Translate into English.

1. Кто из этих двух лучший ученик? 2. Она примерила (try on) свои два платья и надела самое нарядное (smart). 3. Он осмотрел все компьютеры и купил самый современный (modern). 4. Кто самый высокий ученик в классе? 5. Из двух игрушек мальчик выбрал самую яркую.

Exercise 21. Give the superlative form of the adjectives in brackets.
1. The Pan-American Highway is (long) road in the world. 2. The Beatles were (successful) pop group. 3. Japan has (crowded) railways in the world. 4. This is our (old) national airline. 5. The Chrysler Building was once (tall) in the world. 6. Is English (useful) language to learn? 7. This is one of (expensive) stores in the city. 8. The Queen must be (rich) woman in the world. 9. Unfortunately, I haven't heard (late) news. I think it was very interesting. 10. Is the Mona Lisa (valuable) painting in the world? 11. His house is (far) in the street. 12. February is (snowy) and (cold) month of the year here. 13. (dangerous) spider is the black widow, whose bite can kill a man in a few minutes.14. The world's (expensive) perfume costs $550 per bottle. 15. (deep) part of the Pacific Ocean is 11 kilometres below the sea-level. 16.1 wonder what his (near) step is going to be. 17. Who are (old) members of the club? 18. It was (late) thing I expected of him. 19. The diamond is (hard) mineral in the world. 20. His house is (far) in our street.

Exercise 22. Translate into English using the proper degrees of the words in bold type.
1. Возьмите этот чемодан (suitcase), он легче вашего. 2. В районе West End находятся самые дорогие магазины. 3. Что ты собираешься делать дальше? 4. Я думаю, что он старше вас, помоложе меня. 5. Это самый талантливый студент в нашей группе. 6. Хотя у нас были самые плохие места, нам очень понравился спектакль (performance). 7. Где ближайшее почтовое отделение? 8. Последний поезд прибывал в полночь. 9. Последние известия были совсем неинтересные. 10. Они получили дополнительные сведения по этому вопросу.

Exercise 23. Open the brackets and give the correct forms of the comparative constructions,

Example: (Much) you read, (well) you will know English. — The more you read, the better you will know English.

1. (Interesting) the book is, (fast) you read it. 2, (Early) you come, (quickly) we finish the work. 3. (Hot) the weather is, (bad) I feel. 4. (Soon) he takes the medicine, (well) he will feel. 5. (Little) she ate, (angry) she was. 6. (Long) the children saw the film, (frightened) they felt. 7. (Late) you come, (little) you will sleep. 8. (Much) you study, (clever) you will become. 9. (Cold) the winter is, (hot) the summer will be. 10. (Near) you come up, (well) you will see the picture.

MAIN COURSE

UNIT 2

Методическое обеспечение:
1.Опорный конспект «Machine-Building Technology».
2.Вопросы для самоконтроля.

Mechanical engineering

Active Vocabulary

to deal with – иметь дело (с), работать, заниматься чем-либо design – проект, конструкция (гл. to design) device – прибор, устройство (syn. unit, tool, machine, mechanism, engine, apparatus, instrument, installation)

to depend – зависеть
origin – происхождение
to date back – относиться (к), восходить (к)
ancient – древний to appear – появляться
tool-maker – мастер, инструментальщик
craftsman – ремесленник
to devise – изобретать
to erect – строить, возводить
forerunner – предшественник
steam – пар
source – источник
widespread – широко распространенный
to assume – принимать, допускать
creation – создание
reliability – надежность
to extend = to raise – повышать, увеличивать, продлевать
machining – механическая обработка
versatile – разносторонний, гибкий
machine-tool – станок
opportunity – возможность
demand – спрос, потребность
trend – направление, тенденция
to be concerned with – касаться, иметь отношение (к), быть связанным (с)
conversion – преобразование

Exercise 1. Choose the right word from the ones given in brackets:

1. Engineering (appears, deals with, extends) machinery of all types. 2. Theoretical research (depends, erects, assumes) on experimental data. 3. These methods of work (devise, raise, date back) to very ancient times. 4. Engineers are to (devise, raise, appear) new types of machine-tools and to improve the old ones. 5. Our main task is to (assume, extend, appear) the service life of the device and to (depend, assume, raise) its reliability. 6. Workers at machinebuilding plants (are concerned, depend, erect) with various types of equipment. 7. Many kinds of (devices, tool-makers, trends) were invented during the Middle Ages.

Exercise 2. Complete the sentences with a suitable word from the box.

opportunity	sources	origin	design	steam	ancient	reliability	demand

1. Many traditions are of recent _____, but some of them date back to _____ times.
2. He is working on the _____ of a new engine.
3. During the Industrial Revolution _____ engines appeared.
4. Many new _____ of energy are used nowadays.
5. We pay much attention to _____ of new devices.
6. We have a good _____ to work at industrial enterprises of our city.
7. The profession of an engineer is always in great _____.

Exercise 3. Find the synonyms from the words in the first column to the words in the second column:

to deal with
design
device
origin to depend on
ancient to appear
craftsman
to devise
to erect
forerunner
widespread
to assume
creation
reliability
to extend
machining
versatile
machine tool
opportunity
demand
trend
conversion

unit old to be concerned with
to build
project
ancestor
source
mechanism to be based on to invent
to come into being master
common
flexible
change to
accept
safety
formation
to raise
processing
chance
need
tendency

Exercise 4. Find an antonym to the first word in every line:

1. to depend – a) to be based; b) to be independent; c) to be concerned
2. ancient – a) modern; b) old; c) early
3. to appear – a) to date back; b) to invent; c) to go away
4. to erect – a) to build; b) to invent; c) to destroy
5. widespread – a) limited; b) broad; c) reliable
6. to assume – a) to take; b) to devise; c) to reject
7. reliability – a) unity; b) unsafety; c) stability
8. to extend – a) to shorten; b) to lengthen; c) to erect
9. to raise – a) to increase; b) to decrease; c) to devise
10. versatile – a) programmable; b) functional; c) one-sided

Exercise 5. Open the brackets using the right form of adjectives:

1. It is one of the (important) questions of our conference.
2. Your English is (good) now.
3. We have (little) interest in this work than you.
4. Today you worked (slowly) than usually.
5. He was one of the (experienced) workers at the factory.

6. It’s the (bad) mistake he has ever made.
7. Oil is (light) than water.
8. He worked (hard) and (hard) as the end of the term came nearer.
9. He’s not so keen on his studies. He’s (interested) in sports and music.
10. You won’t believe it but he is (talkative) than his sister.
11. He thought how much (advanced) and broadminded the (young) generation was.
12. The first edition of the dictionary is (good), the new one is still (good).
13. He turned out to be (angry) than I had expected.
14. He felt (bad) yesterday than the day before.

Exercise 6. Translate the international words:

specialty, machine, technology, construction, operation, activity, automobile, tractor, rocket, civilization, technician, irrigation, system, modern, mechanical, engineer, primitive, efficient, method, energy, Industrial Revolution, electricity, role, object, industrialized, diesel, locomotive, radio, function, automatization, industry, service, intense, robot, process, programmable, computer, instruction, computerization, type, theoretical, practical, qualified, management, production, transport, gas, mechanism.

Exercise 7. Read and translate the text:

My specialty is called Machine-Building Technology. Machine-building **deals with the design**, construction and operation of machines and **devices** of all kinds and research and sciences upon which they **depend**.

People make use of machines in all their activities. Most of these machines are of recent **origin**. Some of them, however, **date back** to very **ancient** times. Automobiles, tractors, trains, planes and rockets **appeared** not so long ago. But without the first **tool-makers** and **craftsmen** of the **ancient** world our present-day civilization could never have developed. The skilled technicians who **devised** irrigation systems and **erected** the marvelous buildings of **ancient** times are the **forerunners** of modern mechanical and civil engineers. But the **tools** they used were rather primitive. During the Middle Ages people began to seek more efficient **devices** and methods of work. Wind, water and animals were used to provide energy for these new **devices**. This lead to the Industrial Revolution of the 18-th century. It began by putting water and **steam** to work; since then machines using electricity, gasoline and other energy **sources** have become **widespread** in the modern world, and it was the 20-th century that machines **assumed** such an important role.

The **machine-tool** is the original **source** of every object in our industrialized world. Automobiles, airplanes, diesel locomotives, washing

machines, electric stoves and radio-sets are made by **machine-tools**. But without the engineer no **machine-tool** could function.

There are two main **trends** in modern machine-building. Firstly, it is automation, including the **creation** of unmanned industries. Secondly, **raising** the **reliability** and **extending** the service life of machines. This, certainly, requires new technology. Intense work is being carried out in our country on new robots. We also need machines that would trace the entire process of **machining**. New technologies and equipment are being constantly **designed** for most branches of engineering. We need automated machines that are **versatile** and programmable and can make different things according to computer instructions. That's why computerization is another important **trend** in machine-building technology.

To design various types of **machine-tools** engineers must have deep knowledge of theoretical sciences connected with their future specialty. That's why a lot of common and special subjects are included in the curriculum of our University. Students also have an **opportunity** to get practical training in the workshops of the University and at industrial enterprises of our city.

Demand for qualified engineers is high. Mechanical engineers have a wide range of job **opportunities**. They may be management, sales, research, design or production engineers both in heavy and light industry. They can also work in service industries such as transport and gas, water and electricity.

Mechanical engineers are concerned with machines, mechanisms and energy **conversion**. Mechanical equipment is at the core of the plants, and mechanical engineers are at the core of production. Without them production would be impossible.

Exercise 8. Answer the questions to the text:

1. What is your specialty?
2. What does it deals with?
3. When did machines appear? Who were the forerunners of modern engineers?
4. What sources of energy were used in the Middle Ages?
5. When did the Industrial Revolution begin?
6. What is the source of all objects in our industrialized world?
7. What are the main trends in modern machine-building?
8. What kinds of machines do we need?
9. What is the third important trend in machine-building?
10. What does the training of future engineers include?
11. What special subjects do our students study?
12. What are the job opportunities for mechanical engineers?
13. What are mechanical engineers concerned with?
14. What is the role of mechanical engineers in modern production?

Exercise 9. Make up short stories on the following topics:

1. the subject of machine-building; 2. the history of machine-building; 3. machine-tools in modern world; 4. modern trends of machine-building; 5. training of future engineers; 6. job opportunities for mechanical engineers; 7. the role of engineers in industrial production; 8. why I chose this specialty.

Exercise 10. Put the verb in brackets into the Present Simple:

1. Modern machine-building (have) many trends.
2. Most of these machines (to be) of recent origin.
3. We also (need) machines that would trace the entire process of machining.
4. Machine-tools usually (work) materials mechanically but other machining methods have been developed lately.
5. Not all industries (require) the same degree of automation.
6. Each industry (have) its own concept of automation that (answer) its particular production needs.
7. Engineering (demand) knowledge of foreign languages.
8. The plant (deal) with metalworking.
9. We (study) many subjects, such as strength of materials and others.
10. Mechanical properties (play) an important role in materials selection.

Exercise 11. Retell the text.

Exercise 12. Read the text.

Mechanicai engineering

Mechanical engineering has been recognized as a separate branch of engineering since the formation of the Institution of Mechanical Engineers in Great Britain in 1847. The development of the textile machinery, steam engines, machine-tools, pumping machinery, turbines and locomotives of that time made such a diversity interest for civil engineers that these and applied subjects were called mechanical engineering.

Mechanical engineering deals with the design, construction and operation of machines and devices of all kinds, and with research and sciences upon which these depend. Among these machines are prime movers such as engines and turbines using air, gas, steam and water as operating media; pumping machines and other hydraulic apparatus; steam boilers, heating, ventilating, air conditioning and refrigerating equipment, transportation structures used in aviation; automotive engineering, railroads and ships, machine-tools, special machines for industry and

for construction of buildings, railroads and harbours. In fact, mechanical engineering enters into the work of all engineers whose machines are to be developed for the processes of specialists of the other branches of engineering. To understand better the extent of the activities and interests of mechanical engineers, the following lists of the professional divisions and technical committees of the American Society of Mechanical Engineers (ASME) are given: professional divisions, applied mechanics, aviation, fuel, graphic arts (printing), heat transfer, hydraulics, industrial instruments and regulators, management, materials handling, metals engineering, oil and gas power, process industries, production engineering, railroad, rubber and plastics, textiles, wood industries.

Exercise 13. Answer the questions:

1. When was Mechanical engineering recognized as a separate branch of engineering? 2. What does mechanical engineering deal with? 3. Why are lists of the professional divisions and technical committees of the American Society of Mechanical Engineers (ASME) given?

Trends in the modern machine-building industry

1. The scientific and technological progress will continue in engineering along two main headlines. Firstly, it is automation, including the creation of «unmanned» industries. Secondly, raising the reliability and extending the service life of machines.

2. This certainly requires new technology. The early machine modules made on a large scale are well suited for «unmanned» industries. Intense work is being carried out by new robots. What we need is not merely manipulators which can take up a work piece and pass it on, but robots which can identify objects, their position in space, etc.

3. We also need machines that would trace the entire process of machining. Some have been designed and manufactured. Over the past few years this country has created new automated coal-digging complexes and machine systems, installations for the continuous casting of steel, machines for spindless spinning and shuttleless weaving, machine-tools for electrophysical and electrochemical treatment of metals, unique welding equipment, automatic rotor transfer lines and machine-tool modules for flexible industries.

4. New technologies and equipment have been designed for most branches of engineering. In the shortest time possible we are to start producing new generations of machines and equipment, which would allow us to increase productivity several times and to find a way for the application of advanced technologies.

5. Large reserves in extending service life for machines can be found in the process of designing. At present, advanced methods have been evolved for designing machines proceeding from a number of criteria. Automatic design

systems allow for an optimizing of the solutions in design and technology when new machines are still in the blueprint stage.

6. A promising reserve in increasing the life of parts is strengthening treatment. In recent years new highly-efficient methods have been found. First and foremost of them is the vacuum plasma method for coating components with hard alloy compounds, such as nitrides and carbides of titanium, tungsten and boron. Methods have been designed for reinforcing machine parts most vulnerable to wear and tear, such as in grain harvesters, to make them last several times longer.

7. Thus, it is not merely numbers engineers and scientists are after, rather it is a matter of major characteristics. In other words, this is a matter of quality, and not of the mere number of new machines, apparatuses and materials.

Exercise 14. Translate international words. Find them in the text.

module, robot, to identify, manipulator, electrophysical, electrochemical, unique, rotor, line, productivity, to reserve, criteria, to optimize, vacuum, plasma, component, nitride, carbide, titanium, apparatus.

Exercise 15. Find equivalents to the following:

срок службы, передовые методы, электрофизическая обработка, модуль станка, система проектирования, составы из твердых сплавов, методы вакуумной плазмы, упрочнение деталей машин, гибкое производство, полностью автоматизированное производство.

Exercise 16. True or False.

1.There are two main trends in modern machine-building: automation and raising of the reliability of machines.
2. The creation of «unmanned» industries is included into automation.
3. Machine modules and robots are not suited for «unmanned industries».
4. Automation and raising of the reliability of machines require new technologies.
5. Advanced technologies are applied in most branches of engineering.
6. The service life of machine parts can't be increased by strengthening treatment.
7. Hard alloy compounds are employed for coating components.
8. The process of designing can also be automated. This gives the advantage of optimizing solutions in design and technology.

Exercise 17. Answer the questions.

1. Name the main trends in modern machine-building. 2. What does automation include? 3. In what way can automation be achieved? 4. What is the role of new technologies? 5. Give some examples of advanced methods for increasing the service life of machine parts. 6. How can the process of designing be improved? 7. What is the main task of the engineers and scientists developing new machines and technologies?

UNIT 3

Методическое обеспечение:

1. Опорный конспект «CV Sample».
2. Вопросы для самоконтроля.

Applying for a job

Writing resumes (CVs*)

Exercise 1. Copy the table and complete it with the correct parts of speech given below.

Noun	Verb	Positive Adjective
	depend	
		responsible
information		
		employable
	compete	
		applicable
transfer		

Responsibility, inform, competition, transfer, dependence, employment, apply, transferable, dependent, informative, competitive, employ, response, application.

Exercise 2. Learn some rules of writing a resume and say what kind of information is usually mentioned in the resume.

Writing a successful resume depends on many factors. Here is a simple guide to the basics of writing a good resume (CV):

1. Take detailed notes on your work experience. Include both paid and unpaid, full time and part time positions. Include your main responsibilities, any other

activities that were a part of the job, the job title and the infor-mation about the company, the dates of employment.
2. Take detailed notes on your education. Include certificates, school names and courses.
3. Include a list of other non-work related accomplishments. These may include competitions won, membership in special organizations, etc.
4. Decide which skills are transferable (skills that will be especially useful) to the position for which you are applying.
*CV – Curriculum Vitae – a summary of academic and professional history and achieve-34
5. Write your full name, address, telephone number, fax and email at the top of the resume.
6. Include an objective for the resume. The objective is a short sentence describing what type of work you hope to obtain.
7. Include skills such as languages spoken, computer programming knowledge, etc. under the heading: Additional Skills.
Tips
Be short! Your fi nished resume should not be more than a page.
Use dynamic action verbs such as: accomplished, collaborated, en-couraged, established, facilitated, founded, managed, etc.
Do NOT use the subject “I”, use tenses in the past, except for your present job.
If the job seeker specialises in any particular systems area, such as brake systems, this should be mentioned as well.

Exercise 3. Complete the sentences with the missing words from the box.
1. In the resume you should give some information about your work … .
2. Include the information on your … : school names and … .
3. Mention the … that will be especially useful for the … .
4. Write your full name, … and telephone number at the … of the resume.
5. Address, certificates, experience, top, job, skills, education

Exercise 4. Study this example of a basic resume and try to understand the meanings of the underlined words.

WILLIAM J. BENNETT
725 Otter Lane
Wausau, WI 54554
(715) 555-6006
SUMMARY OF SKILLS
• Skilled in repair and maintenance of automobiles, vans and trucks, with advanced skills in diesel repair and maintenance.
• Strong background in working with cooling, air conditioning, electrical, fuel, exhaust and steering systems. 35

• Experienced in working with all gauges, wrenches, and machine, air and hand tools.
• Experienced in diagnosing problems, writing accurate work orders and preparing estimates.
PROFESSIONAL EXPERIENCE
Oct 1993 – present Automotive Mechanic, Goodyear Tyre and Repair Service, Galesburg
Responsibilities
• Successfully diagnose and repair of 10 vehicles per week on the average.
• Handle all diesel repairs.
June 1991 – Oct 1993 Automotive Mechanic, Shelby Chevrolet, Hockessin
Responsibilities
• Handled repair and maintenance of domestic cars and trucks.
• Recommended use of a new lubricant, which produced superior results at half the cost of previous lubricant.
EDUCATION/TRAINING
1990 Graduate, Hockessin High School, Hockessing
• Related course work: Automotive Shop, Advanced Auto Shop, Computer Operations
1990–1991 Truman Career Vocational College, Waverly
• Completed curriculum and certifi cation in automotive repair
• Completed additional certifi cation in diesel repair
• Finished second in graduating class

Gauge [geɪdʒ] – счетчик
Wrench [rentʃ] – отвертка
Tyre [taɪə] – шина
Lubricant [lu:brɪkənt] – смазка

Exercise 5. Complete the resume, using the words and word combinations below.
• US
• A position of an automotive mechanic
• Married
• Over 12 years of experience in auto body (кузов) repair operations, customer service, general tune-up and maintenance
• Diagnose and repair all types of vehicles
• 1998 – Denver Community College
• Specialised in brake system repair. Worked well unsupervised
• Automotive Service Excellence (ASE). Received 5 “Gold Seal” awards for excellence in repair and customer service
• Repaired damaged lorries and ordered partsHenry Talbot
3495 Poplar Lane
Denver, CO 55555
1-555-555-1212

henryt@email.com
Personal Information
Marital status: …
Nationality: …
Objective: …
Summary of Skills: …
Employment History
Perry Motors Denver, CO 2003 – Present
Mechanic
Responsibilities: …
Hudson Motors Denver, CO 2000 – 2003
Lorry Mechanic
Responsibilities: …
Jordan Automotive Denver, CO 1998 – 2000
Trainee (стажер) Mechanic
Responsibilities: …
Certifications: …
Education: …

UNIT 4

Методическое обеспечение:

1. Видеофрагмент «Lathe Cutting Tools».
2. Опорный конспект «Equipment instruments».
3. Задания для самоконтроля.
4. Вопросы для самоконтроля.

Equipment instruments

Exercise 1. Match the words on the left with their transcription on the right. Learn to read them correctly. Do you know their Russian equivalents? If not, consult the dictionary.

pincers	[dril]
saw	[hæmə(r)]
spanner	[pinsəz]
drill	[sɔ:]
chisel	[skru:draivə(r)]
hammer	[plaiəz]
screwdriver	[tʃiz(ə)l]
pliers	[spænə(r)]

Exercise 2. Make verbs corresponding to the adjectives.

Example: dark – darken

tight – thick – loose – wide – light – deep

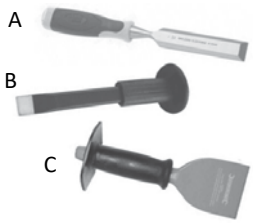
Exercise 3. Explain the function of the tools (b) the way it is shown in the example. Use the expressions below (a).

Example: Pincers are for pulling out nails.

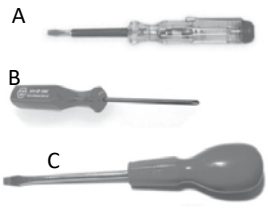
a) grip things / cut metal pipes / tighten and loosen nuts / cut wooden planks / tighten and loosen screws / drive in nails / drill holes / pull out nails / cut holes in wood

b) pincers (клещи)
handsaw (пила)
spanner (гаечный ключ)
drill (сверло)
chisel (резец, долото)
hacksaw (ножовка)
hammer (молоток)
screwdriver (отвертка)
pliers **(**плоскогубцы**)**

Exercise 4. Read the text and fill in the table below with the information from the text.



Here are three types of chisel. Chisel *A* is used for cutting soft materials, such as wood, and chisel *B* is used for cutting metal. Chisel *C* is for cutting away old plaster and brickwork.



Screwdriver *A* is for tightening and loosening screws on electrical equipment. *B* is for loosening very small screws and *C* is for loosening ordinary screws.

Hammer *A* is for hammering in nails and also for pulling nails out of wood. Hammer *B* is for breaking rocks and concrete. Hammer *C* is for breaking bricks.

tool	**job**
a) Chisel A	cuts soft materials
b) Chisel B	…
c) Chisel C	…
d) Screwdriver A	…
e) Screwdriver B	…
f) Screwdriver C	…

Exercise 5. Match *a–i* with *1–9*:

a) combustible	1) легкий
b) soft	2) гибкий
c) brittle	3) мягкий
d) hard	4) жесткий, негнущийся
e) rigid	5) твердый, прочный
f) light	6) хрупкий, ломкий
g) tough	7) тяжелый
h) fl exible	8) жесткий, прочный
i) heavy	9) горючий

Exercise 6. Answer these questions and give reasons. Use the words in brackets.

***Example*:** Is wood a good material for making car engines (двигателей)? (combustible + soft) – No, because it's too combustible and too soft.

1. Is glass a safe material for safety goggles (защитные очки)? (brittle)
2. Is plastic safe for making fly wheels? (light)
3. Is aluminium a good material for making car bodies (кузова)? (light)
4. Is wood safe for making seats? (tough)
5. Is concrete a good material for making a crankshaft (коленчатый вал)? (brittle)

Exercise 7. Are these the right tools for the job? If not, give reasons.

***Example*:** Ron wants to twist electric wires together using a pair of scissors. – Wrong tool. Scissors are too sharp.

1. John is cutting a thick electric cable with a table knife.
2. Alan is trying to drill a 30 mm hole in a metal plate. The drill bit has a diameter of 25 mm.
3. Mike is trying to cut metal rods with a handsaw.
4. Alex is trying to drive nails into a plank of wood by hitting them with a spanner.
5. George is hammering two planks of wood together using 40 mm nails.
6. Each plank is 30 mm thick.
7. Gary is trying to cut holes in wood with a hammer.

Mechanical tools

Chipping metal and chipping tools

Chipping is a process of removing metal from a workpiece by means of a cutting instrument such as a chisel and a hammer. This process is used when a large piece of metal has to be removed from a workpiece; this process is very labour-consuming1 and is applied only in cases when the workpiece cannot be machined. Chipping is used in cases when it is necessary to cut off a piece of metal from sheet metal. Chipping of large parts is always done on an anvil but very often it is done in a bench vice. The workpiece to be tooled is fixed during the cutting process in the bench vice.

There are different tools used in metal-working shops for chipping stocks such as chisels. A chisel is a tool made of very hard steel, having a cutting edge at one end of the blade. This cutting edge is wedge-shaped. Under the effect of an external force applied to the wedge it cuts into the metal. The work of the wedge depends mainly on its cutting angle. The cutting edge of the chisel should be sharpened to an acute angle so as to provide for the best cutting ability, depending on the stock to be chipped. The harder the metal, the larger should be the cutting

Hammers are striking tools used in chipping, bending and other operations. Hammers are made of a solid piece of forged tool carbon, steel, their weight depending on the stock to be removed.

---

1. labour-consuming - трудоемкий

Exercise 1. Use the following words and phrases in sentences of your own:
to chip, chisel, stock, mechanical tolls, blade, wedge, edge, cutting angle, acute angle, plane, lip angle, clearance angle, cape chisel, front rake, to strike, to forge, solid

Exercise 2. Retell the text giving answers to the following questions:
1. What is chipping? 2. What instruments are used in chipping? 3. What is a chisel? What types of chisels do you know? 4. What does the work of a chisel depend on? 5. What does the angle of the cutting edge of a chisel depend on?

Exercise 3. Fill in the blanks with prepositions by, from, in, of, on:
1. Chisels are used … removing stock … works. 2. Chisels are usually made … a high grade steel. 3. The cutting edge … a chisel is ... the form … a wedge. 4. The correct cutting angle … a chisel depends … the strength …a stock to be chipped. 5. Stocks are chipped ... means … a chisel and hammer.

Exercise 4. Supply antonyms for the following words:
hard, large, suitable, convenient, backward, long

Exercise 5. Make up adverbs from the following words and translate them into Russian:
different, hard, main, external, large, convenient

Exercise 6. Change the following sentences using the Infinitive Construction and translate them into Russian:
Example: The chisels *which are to be used for* chipping metals are made of high grade steel. The chisels *to be used* for chipping metals are made of high grade steel.
1. Different types of chisels are made of a good grade chisel steel which has to be forged, annealed, and then hardened and tempered. 2. Chisels which must be applied for chipping metal stocks are made of hard steel. 3. Working a metal to a desired shape by forging produces the best combination of physical characteristics for parts which will be highly stressed. 4. An auxiliary equipment which will be used together with the forging hammer must withstand the vibration or impact of the forging blows. 5. The weight of hammers depends on the stock which will be removed. 6. The work required to separate the chip from the stock will depend upon the material which is to be machined and the separation area.

Exercise 7. Translate the following sentences, observing different meanings of the words and word combinations given in italics: Pliers, or wire-cutters (Fig. 4) are used for cutting thin.
1.There are different *means* of chipping stocks.2. Chipping is performed *by means of* such instruments as a chisel and a hammer. *3*. It *means* that you have to remove some more metal from the workpiece. 4. *By no means* should this chisel be used

for this workpiece. 5. A chisel must *by all means he* applied for removing some metal from the work-piece.

Exercise 8. Make up questions to which the italicized words are the answers: 1. The workpiece *to be tooled* is fixed during the chipping process in the bench vice. 2. A chisel is a tool made of *very hard steel.* 3. A chisel has a cutting edge *at one end of the blade.* 4. The cutting edge of a chisel is *wedge-shaped.* 5. The angle between the two edges of the tool in the plane of the true rake is called the *"lip angle".*

Metal-cutting and Locksmith's tools

Metal cutting differs from-chipping in substituting impact stresses by pressing forces in this operation. Cutting is used for separating some part from a piece of metal as well as to cut angles, grooves and pipes. Depending upon the shape and size of workpieces cutting is done by means of different cutting tools such as pliers, bench-shears, alligator shears, hack saws and pipe-cutters made of carbon steel.

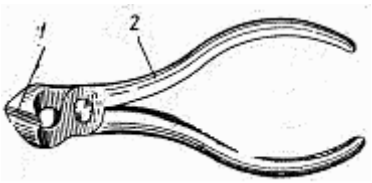


Fig. 1. Pliers:

1 – cutting jaw; 2 – handle

Pliers, or wire-cutters (Fig. 4) are used for cutting thin wire. Pliers consist of two cutting *jaws* and two *handles.*A piece of wire is placed between the cutting jaws and the wire is cut by exerting pressure on the handles of the pliers.

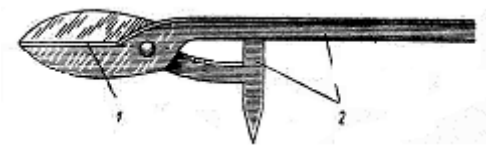


Fig. 2. Bench-Shears:

1— shear blade; *2* — handle

Bench shears are made of steel. *Lateral* surfaces of shear blades are *hardened*, sharpened and ground.

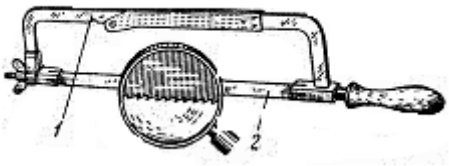


Fig. 3 Hack Saw

1 — frame: *2* — toothed blade

A hack saw (Fig. 6) is used for cutting thick metal sheets, bars, round-shaped material, etc. The hack saw consists of a frame and a long toothed blade made of tool carbon steel. The teeth on the blade are hardened. The blades with different pitches have different applications, the pitch of the blade depending on the material to be sawed.

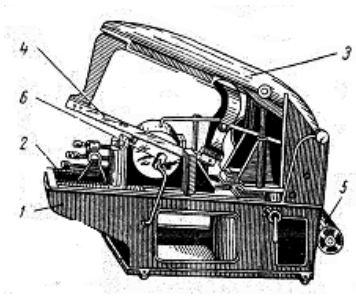


Fig. 4. Alligator Shears:

1 - bed; *2* — bedplate; *3* — arm; *4* — cutting blade; 5 — electromotor; *6* — machine vice

the pitch of the blade used for sawing this material, and vice versa.

Fig. 4 shows alligator shears which is a *heavy duty machine)* for cutting materials of large sections such as pipes, *beams*, auto frames, axles and different types of industrial *scrap.* The alligator shears consist of cast iron *bed* 1 and *bedplate 2. Arm 3* is *mounted* on the bedplate. Cutting blade *4* is fixed within the arm. Electromotor *5 imparts reciprocating motion* to the arm and the, blade. The workpiece to be cut is clamped in machine vice *6.*

Special pipe-cutters (Fig. 5) serve for cutting pipes. The pipe-cutter consists of *body 1*, handle *4*, and three steel cutting rollers. Two rollers *2* installed on the fixed axles of the body and roller *3* installed on the axle of the handle may revolve and cut a pipe fixed in a special pipe fixture. For this purpose the pipe-cutter is turned round the pipe to be cut, pressing the cutting rollers against its surface.

Fig. 5. Pipe-Cutters:

1- body; *2* – rollers; *3* – roller; *4* - handle

Exercise 1. Use the following words and phrases in sentences of your own: bedplate, arm, pitch, bar, lateral, metal cutting tools, pliers, pipe-cutters, hack saw, cutting jaws, to harden, right angle, bench-shears, to press, bed, industrial scrap, groove, to impart, reciprocating motion, to install, fixture, body

Exercise 2. Supply the missing words:

1. The p… of a blade is the distance from the point of one t… to the point of the next t… .2. This pitch is expressed by the number of t... per one inch of the b… length. 3. The hand hack saw blade is a thin blade with teeth formed on one e… . 4. The flexible h... s... blade is used for s...ing tin, copper, aluminium and other soft metals. 5. Cutting is done by means of different c... t... . 6. For cutting wire such cutting t... as p... are used. 7. One handle of b...-s... is at a r... a... to the other.

Exercise 3. Translate the following sentences into English using the infinitive instead of the attributive clauses:

Example: Материал, который нужно разрезать, зажимается в тисках. The metal *to be cut* is clamped in the vice.

1.Шаг полотна ножовки зависит от материала, который будет распиливаться, 2. Различные виды стали, которые используются для полотна ножовок, изготовляются на нашем заводе. 3. Полотно ножовки, которое надо использовать для распиливания этих тонких листов, должно иметь 32 зуба на один дюйм. 4. Труба, которую надо разрезать труборезом, будет закреплена в специальном приспособлении. 5. При вращении трубореза вокруг изделия, которое надо разрезать, создается режущее усилие.

Exercise 4. Make up questions to which the italicized words are the answers:
1. This bar is subjected to *the action of two sets of external forces.* 2. Cutting is used *in cases when it is necessary to separate a piece of metal.* 3. *Thin wire* is cut with pliers. 4. Sheets of metal are cut *with bench-shears.* 5. *Cutting tools* are made of *carbon steel:* 6. Pliers consist of *two cutting jaws and two handles.*

Exercise 5. Giving the answers to the following questions describe the principle of operation of pliers, bench-shears, and alligator shears and pipe-cutter.

1. What are pliers used for? 2. What do the pliers consist of? 3. What is the funtcion of pliers, jaws and handles? 4. What material are bench-shears made of? 5. What are the bench-shears provided with? 6. What purposes are alligator shears used for? 7. What principal parts do the alligator shears consist of? 8. What part of the alligator shears is the arm mounted on? 9. Where is the cutting blade of the alligator shears fixed? 10. What motion does the electromotor impart to the arm and the blade? 11. What purpose are pipe-cutteres used for? 12. What parts does a pipe-cutter: consist of? 13. How is the cutting performed? 14. Where is the-pipe fixed for cutting?

Mechanical tools

Both in maintenance and in repair of machines all kinds of fitting operations are applied. An important role is played by disassembling and assembling operations. Special instruments are used for performing these operations.

Among the variety of mechanical tools: used for disassembling and assembling machine parts and in their repairing are *wrenches* (Fig. 6). According to their construction and application wrenches may be of different types: *single-ended*

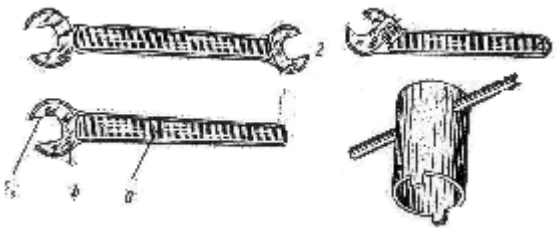


Fig. 6 Wrenches:

1 — single-ended wrench (*a* — handle; *b* — head; *c* —span); *2* — double-ended wrench; *3* — adjustable wrench; *4* — socket wrench and *double-ended nut wrenches, adjustable wrenches, socket wrenches* and *special wrenches.*

A nut wrench is used for *screwing* and *unscrewing nuts.* It consists of a handle and a *head* with an opening known as the *span.*

Adjustable wrenches may be used for unscrewing nuts and bolts of different dimensions.

Socket wrenches are applied in cases when nuts or bolt heads located in *recesses* are hardly accessible for a nut wrench.

Special wrenches are used for unscrewing and screwing nuts of a definite type Wrenches are used: by drivers for repairing cars, in locksmith's shops and *fitter's shops.* Fitters use them to screw different types of machine parts as: washers, bolts, *shafts,* etc. Plumbers use them to repair pipes, taps, etc. Besides different types of wrenches there are *round pliers or needle, nose pliers* which are widely used by locksmiths, *electricians* and other specialists for gripping, screwing or cutting off thin metal and wires.

Exercise 1. Use the following words and phrases in sentences of your own: nut, to screw, to maintain, to unscrew, to assemble, to disassemble, nut wrench, adjustable wrench, Socket wrench, to grip, plumber, electrician, fitter

Exercise 2. Answer the following questions:
1. What operations are applied in. maintenance and repair of machines? 2. What instruments are used for disassembling and assembling machine parts? 3. How are wrenches subdivided? 4. What is a nut wrench used for? 5. When are adjustable wrenches applied? 6. In what cases are socket wrenches used? 7. What wrenches are used for screwing and unscrewing nuts? 8. By whom are different wrenches used? 9. What other mechanical tools can be used in repairing?

Exercise 3. Find in the text nouns for the following verbs:
to maintain, to operate, to construct, to fit, to assemble, to apply

Exercise 4. Supply antonyms for the following words: disassembling, to screw, difficult, single-ended,accessible

Exercise 5. Supply synonyms for the following words: to locate, to grip, widely, different, dimensions

Exercise 6. State the functions of alt, the -ed forms and translate the following sentences into Russian:
1. Wrenches used to unscrew and screw nuts are known as adjustable wrenches. 2, Different wrenches are used to? screw different types of. machine parts, such as washers, bolts and shafts. 3. Locksmiths and fitters use special instruments depending on the parts of machines to be disassembled and assembled. 4. Nut wrenches may be used for screwing different nuts. 5. Tools called "wrenches" are used -for turning bolts and nuts. 6.: Tools known as S-wrenches, angle wrenches, etc. are named so according to their shape. 7. the wrenches may also be named from the object on which they are used. 8. Adjustable wrenches are named so because they may be applied for screwing and unscrewing bolts and nuts of different sizes.

Exercise 7. Translate the following sentences into English:
1. Обычно механические ключи, используемые при ремонте разнообразных деталей, изготовляются из прочной стали. 2. Кусачки могут применяться для операций, выполняемых слесарями. 3. Торцовый ключ может применяться для завинчивания гаек, расположенных в углублениях. 4. Слесарь часто пользуется инструментами, называемыми разводными ключами. 5. Среди многих инструментов, применяемых электриками, есть круглогубцы.

Machine-cutting tools

cutter, tool, chisel, incisor, knife, graver, nipper, glasscutter, burin

- cutter |ˈkʌtər| — резак, фреза, резец, катер, резчик, режущий инструмент, закройщик
плужный резец — plough cutter
фасонный резец — sectional cutter
резец мешочного бура — sack borer cutter

- tool |tuːl| — инструмент, орудие, резец, станок, орудие труда,
прямой резец — step-and-turning tool
широкий резец — broad-nose tool
плоский резец — flat-pointed tool

- chisel |ˈtʃɪzl| — долото, зубило, стамеска, резец, чекан, отруби
круглый резец — round-shank chisel
кузнечное зубило; резец — point chisel
резец рекордера; рекордер — cutting chisel

- incisor |ɪnˈsaɪzər| — резец, резцовый зуб, передний зуб
резцовый зуб; резец — incisor tooth

- knife |naɪf| — нож, скальпель, резец, скребок, зуб, хирургическая операция, струг
резец токарного станка — lathe knife
резец фасонного рубанка — header knife
резец для обрезки кромок — edging knife

- graver |ˈgreɪvər| — резец, гравер, резчик, гранильщик
гравировальный резец для проведения тонких линий — fine-line graver
поворотный гравировальный резец; шарнирный гравировальный резец; рулетка — swivel graver

- nipper |ˈnɪpər| — кусака, мальчуган, воришка, резец, клешня, передний зуб
- glasscutter — стекольщик, резец, алмаз для резки стекла
- burin |ˈbjʊrɪn| — резец гравера, грабштихель

резец и клык — labial tooth
вставной резец — toolbit insert
струговый резец — plough pick
радиальный резец — radial pick
отделочный резец — shave tooth
передний зуб, резец — front tooth
резец, передний зуб — incisive tooth
подача воды на резец — pick-face flushing

резец рубанка; резец — tongue of a plane
тангенциальный резец — tangential pick

Родственные слова, либо редко употребляемые в данном значении
- cutting tool — режущий инструмент
- point |pɔɪnt| —
точка, пункт, момент, очко, место, дело, смысл, балл, вопрос, суть
поворотный гравировальный резец; шарнирный гравировальный резец — swivel-pen point

- bit |bɪt| —
бит, долото, кусочек, кусок, частица, сверло, удила, бур, бородка
отбойный резец — rip bit
резец колонкового бура — core bit wing
стальной отбойный резец — steel rip bit

- blade |bleɪd| —
лезвие, лопасть, диск, клинок, полотно, перо, крыло, травинка, лист
чистовой резец — finishing blade
прорезной резец — end-cutting blade
многолезвийный резец — segmental blade

- scriber — чертилка
шарнирный гравировальный резец — swivel-head scriber
поворотный гравировальный резец — swivel head scriber
скрайбер с алмазным резцом; алмазный резец — diamond scriber
гравировальный резец с дистанционным управлением — remote control scriber

- stylus |ˈstaɪləs| — стилус, граммофонная иголка, перо прибора
гравировальный резец — engraving stylus
записывающий резец; резец — cutting stylus
игольный гравировальный резец — needle-pointed stylus

The cutting tool is that part of a cutting machine which serves for removing material from revolving work. If either incorrect or faulty cutting tools had been used for metal-cutting operations, the quality of work would have become poor and cost would have been higher. That is why careful attention should be given to the cutting tools in any metal-cutting operation.

Cutting tools are made of hardened and *tempered* steel or alloy metals. All the cutting tools are adapted to perform certain work in the most efficient manner and, accordingly, they may be subdivided into *turning tools, boring tools, milling cutters, planing tools, shaper tools,* etc. These tools having one *effective cutting edge* along which excess material from the workpiece is removed are known as *single-pointcutting tools.*

Other tools removing excess material on two or more cutting edges simultaneously are known *as multiple-point faulting tools.* Each cutting tool consists of a shank for holdingthe tool in the machine and a *tip* or cutting edge for removing chips from the work.

The single-point cutting tools fall into several types, such as: solid, forged tools having the same material throughout; (2) solid tools having a tough steel shank and a tip made of high alloy steel which is *welded* on to the shank; (3) solid tools with a tip *brazed* (Fig. 19) on to the shank; and (4), *inserted tools* having a small piece of the cutting edge made of carbide steels. Inserted tools held in a tool holder owing to a screw wedge are used for machines of a complicated nature when it is necessary to prolong tool *life* as long a time as possible.

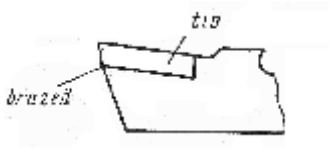


Fig. 7. CuttingTool

The various types of cutting tools differ in shapes, and in the angles to which: the surfaces of the tools are ground. The cutting tip should be ground by hand or by machine withcorrect angles (Fig. 20) on the top face (rake angles) and sides (clearance angles) to a desired shape. The shape of the tool, as well as the proper rake and clearance angles depend upon a large number of factors, such as the specific operation, the material to be cut and the material from which the tool, is made. The top rake is usually *provided* for the tool holder by the tool being *set* at an angle, which is correct for machining steel and cast-iron. On solid tools it is necessary to grind the top rake in the tool.

By *adjusting* the tool in the *tool post* through a wedge, this top rake can be varied somewhat to suit the material being *turned.* The softer the material the less the top rake should be as there is a tendency for the tool to dig in if the rake is too great. The side rake also varies with material being machined. The proper angle is from 6° for soft material to 15^0 for steel.


Fig. 8. Cutting Tip:

A - top rake; *B* - side rake; *C* - front clearance; *D* - side clearance

The front clearance depends: on the diameter of the work to be turned. To turn cast-iron it is advisable to set the tool above; centre. If the tool were ground square[1]without any front clearance, it would not cut but rub on the material to be turned below the cutting edge of the tool. The front clearance should be less for

small diameters than for large diameters, ranging, from 8 to 15°. The tool is ground with, the side clearance to prevent the *dragging* of the tool on the *shoulder* formed by the cut. This angle is usually about 6° from the vertical and is constant.

For efficient operation of the machine, the proper surface speed of the work being machined must be maintained. If the speed is too slow, the job takes more time than necessary and often the work produced is unsatisfactory. On the other hand, if the speed is too great, the cutting edge will be worn down too rapidly. Frequent grinding will be necessary, which is also wasteful. For ordinary production work the speed should be as great as the tool will stand without requiring sharpening more often than every: two or three hours when cutting continuously.

Cutting tools used for longitudinal turning are subdivided into *toughing tools* and *finishing tools.*

Roughing tools are applied for roughing or removing the excessive metal from the work. Such tools are usually carbide-tipped and they have a long cutting edge. *Angular roughing tools* are very convenient for turning surfaces of the parts which are at the *chuck cams,* as well as for *facing.*

Finishing tools are used after the work has been turned with a roughing tool to give accurate size and clean surface to the work being machined.

Before starting the cutting operation tools should be clamped in the tool-holder (Fig.; 21) by means: of two or more bolts.

Side tools are used for cutting faces. A side tool has a long cutting edge set at an angle of about 5° with respect to the surface of the work to be cut, and a short cutting edge. This cutting edge, is largely *bevelled* to facilitate the approach of the tool tip to the centre of the part fastened between the two *lathe centres.*

Necking tools are used for grooving, since the width of grooves is usually small. The cutting edge of a necking tool is narrow, which increases the danger of its breakage. To prevent this breakage the height of the head is made several times larger than the width of the cutting edge.

Material is cut off by means of tools known as *cutting-off tools,* which are similar to necking tools. The difference is that they have a longer head which should be a little larger than one-half of the diameter of the *blank* to be cut.

---

1. If the tool were ground square — если бы резец затачивался под прямым углом

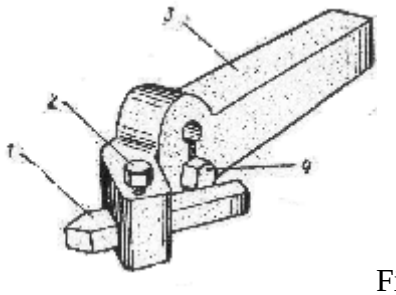


Fig. 9. ToolHolder

1— cutting tool; 2 — bolt; *3* — shank; *4* — bolt

Exercise 1. Use the following words and phrases in sentences of your own:
to bevel, side tool, facing, roughing tools, to grind, to rough, speed, finishing tool, to provide, to adjust, to set, single-point cutting tools, turning tools, effective cutting edges, tip, shank

Exercise 2. Use these verbs in the past participle form and make up sentences using past participles as attributes:
to grind, to turn, to form, to cut, to temper, to harden, to provide

Exercise 3. Underline the suffixes and prefixes and translate into Russian the following group of words of the same stem:
to adjust, adjustable, adjusting, adjustment; to continue, continual, continuance, continuation, discontinuation, discontinuance, to discontinue; to divide, divided, division, divisional, divisor, to subdivide, subdivisible, subdivision

Exercise 4. Choose synonymical groups out of the following list:
the sharper, to undergo, to understand, precise, accuracy, to realize, to complete, to start, to subject, to finish, to begin, accurate, to clamp, precision, to squeeze, to grind

Exercise 5. Change the following sentences, using the subordinate clause instead of participle phrases. Translate the sentences into Russian:

Example: Cutting tools *used for various metal-cutting operations* have quite wide range of shapes.
Cutting tools *which are used for various metal cutting operations have quite* a, wide range of shapes.
1. The number and types of cutting tools used in practice are very large. 2. Tools designed to take heavy roughing cuts are known as roughing tools. 3. Milling cutters have several cutting edges giving the cutter the advantage of cutting. 4. Each blade of the milling cutter is a single-point cutter provided with proper rake and clearance angles. 5. The cutting angle is determined by the physical characteristics of the material being machined. 6. A high cutting speed, a small chip thickness and a large rake angle are factors facilitating the flow of the chip over the face of the tool. 7. Different kinds of cutting tools are used for metal cutting processes depending upon the kind of metal being cut. 8. The elements of a single-point tool used for turning operations are shown in Fig. 20.

Exercise 6. State the kinds of subordinate clauses in the following sentences and translate them into Russian:
1. The distance that the tool is set into the work for cut-ting operations is referred to as the depth of cut. 2. Metals may be so strong that it is difficult to produce a

tool capable of cutting off the chip without frequent failures. 3. If the metal to be cut is soft, the top rake of the tool is decreased. 4. When a tool cuts metal a force is exerted on its face by the material pushed ahead, and a friction force is set up along the face of the tool by a sliding chip. 5. If the tool were not ground correctly, it would not freely. 6. The basic principle of design employed in making single-point cutting tools is the wedge which can be modified in accord- ance with requirements.

Exercise 7. Translate the following sentences into. English using different ways of expressing obligation:

1. Все резцы, в зависимости от типа машины, на которой они используются, нужно подразделять на токарные, фрезерные, строгальные и другие. 2. Для того чтобы продлить работу режущего инструмента, следует правильно выбирать скорость резания. 3. Угол заточки инструмента должен меняться в зависимости от материала обрабатываемой детали. 4. Инструмент, который нужно затачивать и устанавливать в определенное положение в автоматическом станке, следует насаживать с меньшей силой, чем обдирочный резец. 5. Режущие инструменты могут затачиваться до тех пор, пока не останется маленькая полоска режущей кромки, и все же их можно еще использовать для резки материала.

Exercise 8. Give different meanings of the words proper, to make, one, for, above, more, that. Give some examples of their use.

Exercise 9. Make up questions to which the italicized words are the answers:

1. On solid tools it is necessary to grind the top rake *in the tool. 2. To turn cast-iron* it is necessary to set the tool above centre. 3. The tool is ground with the slide clearance *to prevent the dragging of the tool on the shoulder formed by the cut.* 4. *If the surface of the work being machined is too great,* the cutting edge will be worn too rapidly. 5. Roughing tools are applied for *roughing or removing excessive metal from the work.* 6. *To prevent the breakage of the cutting edge of, a necking tool,* the height of the head is made several times larger than the width of the cutting edge.

Exercise 10. (a) Read and translate the following text without using a dictionary:

Lathe tools are made of carbon steel, high speed steel and alloys such as stellite and cemented carbide. The stellite and cemented carbide tools are becoming more generally used as their cost is reduced. There are but few carbon steel tools used,[1] the general practice is to use high-speed tool bits in holders. One should determine the kind of tool to be ground, as carbon and high-speed steel require different treatment. Tools should be marked to show the kind of material from which they are made. To ensure the proper operation of a lathe the cutting tools should be ground by hand or machine. In machine grinding the tool is supported rigidly in a chuck or holder and ground semi-automatically to the desired rake and

relief or clearance angles. In grinding by hand, the tool should be supported oh the work rest and moved back and forth across the entire face of the grinding wheel. The accuracy of a tool ground by hand depends almost entirely on the skill of the operator.

1. there are but few carbon steel tools used — применяются лишь немногие резцы из углеродистой стали

(b) Answer the following questions:

1. What steel are lathe tools made of? 2. Why should one determine the kind of tool to be ground? 3. How should the cutting tools be ground to ensure the proper operation of a lathe?

Exercise 11. Give answers to the following questions.

1. What parts does a cutting tool consist of? 2. What is the shank of the cutting tool used for? 3. What is the synonym for the word "cutting edge"? 4. By what means can the cutting tip of a tool be ground? 5. To what angles-should the tip of the cutting tool be ground? 6. What do the shape of a tool as well as its rake and clearance angles depend upon? 7. How can the top rake be varied? 8. What does the top rake depend on? 9. How does the side rake Vary for soft material and for steel? 10. What does the front clearance depend on? 11. What action would be performed by the tool if it were ground square without any front clearance? 12. Why is the tool ground with a side clearance? 13. How should the tool be clamped in the tool holder before starting the cutting operation?

UNIT 5

Методическое обеспечение:

1. Опорный конспект «Engineering materials».
2. Опорный конспект «Types of metals».
3. Опорный конспект «Types of steel».
4. Вопросы для самоконтроля.

Engineering materials

Vocabulary:

alloy — сплав
carbon— углерод
stiff — жесткий
to corrode — разъедать, ржаветь
rusty — ржавый
stainless — нержавеющий
to resist — сопротивляться
considerably — значительно, гораздо
tough — крепкий, жесткий, прочный, выносливый
forging — ковка
welding — сварка
brittle — хрупкий, ломкий
cutting tools — режущие инструменты
surgical instruments — хирургические инструменты
blade — лезвие
spring — пружина
inclusion — включение
to affect — влиять
manganese — марганец
silicon — кремний
rust-proof — нержавеющий
nitrogen — азот
tungsten — вольф

Exercise 1. Read the text and write active words and word combinations:
- nouns meaning different materials;
- word combinations to classify objects;
- verbs characterizing materials.

TEXT. ENGINEERING MATERIALS

Engineers have to know the best and most economical materials to use. Engineers must also understand the properties of these materials and how they can be worked. There are two kinds of materials used in engineering — metals and non-metals. We can divide metals into ferrous and non-ferrous. The former contain iron and the latter do not contain iron. Cast iron and steel, which are both alloys, or mixtures of iron and carbon, are the two most important ferrous metals. Steel contains a smaller proportion of carbon than cast iron. Certain elements can improve the properties of steel and are therefore added to it. For example, chromium may be included to resist corrosion and tungsten to increase hardness.

Aluminium, copper, and the alloys (bronze and brass) are common non-ferrous metals.

Plastics and ceramics are non-metals; however, plastics may be machined like metals. Plastics are classified into two types — thermoplastics and thermosets. Thermoplastics can be shaped and reshaped by heat and pressure but thermosets cannot be reshaped because they undergo chemical changes as they harden. Ceramics are often employed by engineers when materials which can withstand high temperatures are needed.

Exercise 2. Find equivalents from the text.

Model: There are two kinds of ***engineering materials.*** There are two kinds of ***materials used in engineering***.

1. Nickel steel is ***a mixture*** of iron, carbon and nickel. 2. Chromium ***can be added*** to steel to provide a good cutting edge. 3. There are many ***kinds*** of steel used in industry. 4. Ceramics ***are used*** by engineers where heat-resistant materials are needed. 5. Chromium steels ***resist*** corrosion.

Exercise 3. True or false.
Engineers must know the properties of engineering materials. 2. All materials can be classified as metals and non-metals. 3. Non-ferrous metals can contain iron. 4. Steels have to contain more carbon than cast iron. 5. Ceramics can resist high temperatures. 6. Thermosets may be machined. 7. Thermoplastics can be shaped and reshaped.

Exercise 4. Join sentences as in the model using: however — однако, therefore — следовательно, because — так как.

Model 1
Copper does not rust.
Copper corrodes.
(a + b) Copper does not rust; however it corrodes.
Model 2
Cast iron is a brittle metal.
Cast iron is not used to withstand impact loads.
(a + b) Cast iron is a brittle metal, therefore it is not used to withstand impact loads.
Model 3
Titanium is used for aircraft frames.
Titanium is light and strong.

(a + b) Titanium is used for aircraft frames because it is light and strong.

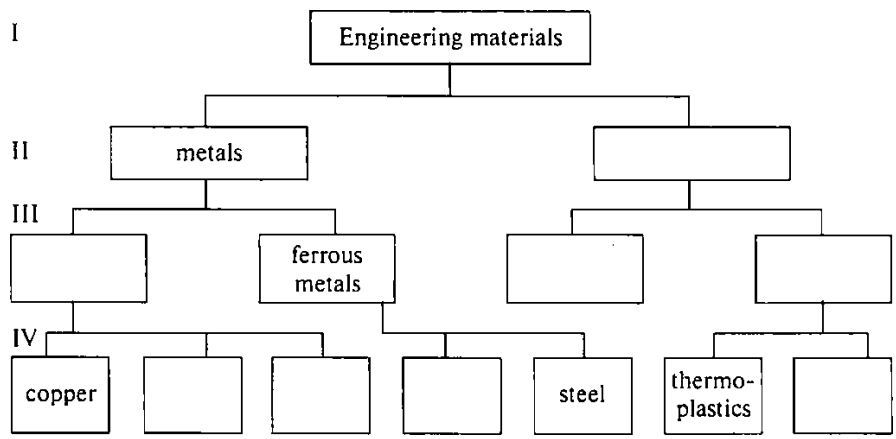
1. Chromium resists corrosion. Chromium is added to steels to make them rust-proof. 2. Manganese steel is very hard. Manganese steel is used for armour plate. 3. Bronze has a low coefficient of friction. Bronze is used to make bearings. 4. Nylon is used to make fibres and gears. Nylon is tough and has a low coefficient of friction. 5. Tin is used to coat other metals to protect them. Tin resists corrosion. 6. Tin is expensive. The coats of tin applied to other metals are very thin. 7. Stainless steels require little maintenance and have a high strength. Stainless steels are expensive and difficult to machine at high speeds. 8. Nickel, cobalt and chromium improve the properties of metals. Nickel, cobalt and chromium are added to steels.

Exercise 5. Remember:
-tight — характеризует качество соединения
-proof, -resistant — характеризуют свойства материалов.
Example:
an air-tight connection — a connection which air cannot pass through a heat-resistant material — a material which is not damaged by heat a a moisture-proof coating — a coating which moisture cannot pass through an acid-proof cement — a cement which is not damaged by acid.

Exercise 6. Translate word combinations.
a gas-tight seal, an oil-proof cement, a water-resistant grease, a lightproof coating, a water-tight connection, a sound-proof engine cladding, a rust-proof surface, a shock-proof mounting, a corrosion-resistant steel, a weather-proof surface

Exercise 7. a) Complete the scheme with the information from the text.

Classification of Engineering Materials



b) Use the following information in sentences of your own:

Exemple: 1. Steel is a ferrous metal. 2. Iron and steel are ferrous metals.

Exercise 8. Answer the questions.

1.What kinds of materials are used in engineering? 2. How are metals classified? 3. What is the difference between ferrous and non-ferrous metals? 4. For what purpose are some elements (such as chromium and tungsten) added to steel? 5. What kinds of non-metals do you know? 6. What can you say about classification and properties of plastics? 7. In what cases are ceramics used.

Ferrous metals

Ferrous metals consist of *iron* combined with carbon, *silicon,* phosphorus and other elements. Carbon is the most important of all elements present in ferrous *alloys.* Ferrous metals are used in industry in two general forms; *steel* and *cast iron,* which differ in the quantity of carbon content". These two ferrous alloys are derived from *pig iron* which is produced in a *blast furnace* in the form of pigs. Metals are usually melted and poured into a form which is called *a "mould".* This process is known as *casting.* The cast metal is shaped in the mould where it cools and *solidifies.* Thus one can cast different objects known as castings. The *shop* where metals are cast is called *a "foundry".* Castings are used in building engines, automobiles and airplanes, and different types of machinery. Steel is iron with a very little carbon content (from 0.05 to 1.7 per cent), which makes it much stronger than iron and is therefore widely used in machine-building. But very much carbon makes steel brittle, which reduces its strength. Therefore the carbon content in steel is confined to certain limits. Cast iron contains a higher percentage of carbon than steel does (more than 2.0 per cent). It is very cheap, in fact, it is the cheapest of all the engineering metals used in machine-building. *Grey iron* foundries are the most numerous because grey iron can be cast into almost any conceivable shape and size. Grey iron is also adapted to a great variety of castings, such as automobile, gas, steam, and hydraulic engine cylinders, *bed plates* for machines, car *wheels,* agricultural machinery parts, furnace and stove parts, water pipes, *gears,* and general machinery parts. The nature of the metal used for grey iron castings is such that castings can be made so hard that ordinary *tool steel* will not cut them or, on the other hand, so soft that they can be readily *machined.* However, in comparison with other casting metals grey iron is weak and will not stand great shock. Hence, the engineer must allow a large factor of safety[1] when specifying the use of grey iron castings, especially where great strength is required, or specify that the castings must be made from some other metal. The alloy of grey castings is composed of iron, carbon, silicon, phosphorus, manganese, and sulphur. These elements are used in different proportions depending on the *grade* of castings. Alloy Grey Iron.

In many lines of *manufacture* and engineering, common grey iron castings have lacked in strength and *wearing qualities,* so that many experiments have-, been conducted with a view to overcome this shortcoming. This has been accomplished, and the alloy is known as alloy; grey iron, which is easy to machine because most "of the carbon present is in free or uncombined state. It is used much,[2] if not entirely, for making steam- and gas-engine cylinders, also for many other castings that require greater strength and wearing qualities than are *furnished* ,by common grey iron. Alloy grey iron is one of the latest alloys developed and has a promising future. It has a *tensile strength* of 40,000 to 60,000 lbs. per square inch[3] as it comes from the mould, and when it is *heat-treated,*

a much greater strength is produced. *Malleable iron*[1] castings are being increasingly used every year in the manufacture of machinery. Many castings that were formerly made of grey cast iron are now made of malleable iron. One of the reasons for using malleable iron instead of grey iron is that malleable iron is much stronger than grey iron castings, particularly in the matter of[4] resisting shock. Malleable iron castings can be made muck thinner in section. However they are seldom 'used in the form they come from the moulds, as they are hard and brittle, and therefore they should be *annealed.* Malleable iron before annealing is usually spoken of as white iron. White iron is difficult to machine because most of the carbon present is in chemical combination with the iron. Malleable iron can be cast into very large bodies *on account of* its high shrinkage and because of the difficulty of annealing. It is the most easily machined of all ferrous alloys. It has to be melted very hot and poured very rapidly, because it solidifies quickly. Malleable iron castings are used in agricultural machinery, railroad *equipment,* automobile parts, and many other products.

The metal is usually tested for *tensile strength* and *elongation.* The tensile strength *ranges* from 38,000 to 55,000 lbs. per square inch and the elongation is usually about 20 to 25 per cent.

---

1. a large factor of safety — большой коэффициент безопасности
2. it is used much — он широко используется
3. lb. per square inch — фунт на квадратный дюйм
4. in the matter of — в отношении

Exercise 1. Use the following words and phrases in sentences of your own:
ferrous metals, steel, cast iron, mould, alloy, pig iron, blast furnace, grey iron, to solidify, foundry, to cast, engineering metals, tool steel, to machine, alloy grey iron, to furnish, malleable iron, to anneal, tensile strength, non-ferrous metals, on account of, grade, to elongate, range

Exercise 2. Answer the following questions:
1. What are the main two groups of metals? 2. What elements do ferrous metals consist of? 3. What is the difference between iron and steel? 4. What is casting? 5. What do we call the shop where metals are cast? 6. Why is steel widely used, in machine-building? 7. What are the main types of iron castings?

Exercise 3. State the forms and functions of the ing-forms and translate the following sentences into Russian:
1. Machine-building industry is the leading branch of heavy industry. 2. The work of casting metals is performed in foundries. 3. Metals consisting of iron with some

other elements are known as ferrous metals. 4. Engineering metals are used in industry in the form of alloys because the properties of alloys are much better than those of pure metals. 5. Steel is iron containing from 0.05 to 1.7 per cent carbon. 6. The blast furnace is called so because a blast of hot air is forced into it while producing the pig iron. 7. Malleable iron before annealing is usually called "white iron". 8. For separating iron from impurities the iron ore must be melted at a very high temperature produced by burning coke in a blast furnace.

Exercise 4. Fill in the blanks with prepositions because of, of, for, in, with:
1. Metals are ... great importance ... our life ... their useful properties. 2. They are widely used ... industrial purposes. 3. There are two large groups ... metals: simple metals and alloys. 4. Alloys consist ... a simple metal combined ... some other elements. 5. Almost all the metals are found ... the earth's crust ... the form ... ores.

Exercise 5. Translate the following sentences with the predicates in the passive form, then change the predicates into active form:

Example: Metals *are usually melted and poured* by founders into a form which is called a "mould". Founders usually *melt and pour* metals into a form which is called a "mould".
1. Different metals are produced by people in different ways. 2. Three methods are now used by us for producing pig iron, 3. Ferrous metals are used in industry in two general forms such as steel and cast iron. 4. The iron ore charged into the furnace has been melted by the heat produced by the coke burning in the blast of hot air. 5. Malleable iron castings are being increasingly used in industry. 6. Great shock will not be stood by grey iron. 7. The heat in the electric furnace was produced by electricity.

Exercise 6. Find in the text nouns for the following verbs:
to cast, to alloy, to anneal, to compare, to manufacture, o machine, to equip to produce

Exercise 7. Make up questions to which the italicized words are the answers:
1. Many experiments have been conducted *to improve the qualities of grey iron castings.* 2. Some castings require *great strength and wearing qualities.* 3. *Malleable iron castings* are much stronger than grey iron castings. 4. Malleable iron can be cast *into very large bodies.* 5. Metals are usually tested *for tensile strength and elongation.*

Exercise 8. Translate the following text in written form using a dictionary:
Production of castings made from different metals requires different types of melting furnaces. The cupola furnace is usually used for melting grey iron. The air cupola, and electric furnaces are used to melt the metal for making malleable iron

castings. For melting steel, the open-hearth, crucible or electric furnaces are used. Non-ferrous metals are generally melted in crucibles or electric furnaces. The fuels mostly used for melting metals are coke, coal, oil and gas. Besides the different types of furnaces, different kinds of moulding sand are also required for making the moulds for different metals. In many cases, it is necessary as well to treat either the metals: or the castings in some special way before the castings can be used.

Steel

Steel is a ferrous material with some carbon content. There are two kinds of steel: *carbon and alloy steel*. The content of carbon in steel may vary from 0.1 to 1.0 per cent. Carbon steel should contain only iron and carbon without any other alloying elements and is divided into:
(1) *Machine steel* with a low carbon content from 0.05 to 0.15 per cent.
(2) *Medium carbon steel* with a carbon content from 0.15 to 0.60 per cent.
(3) *Tool steel* with a high carbon content from 0.6 to 1.50 per cent. Carbon steels are the most common steels used in industry, their properties depending only on the percentage of carbon they contain. Machine steels are very soft and can be used for making machine parts that do not need strength. Medium carbon steels are better grade and stronger than machine steels. Tool steel may be used for manufacturing *toots* and Working parts of machines because of its high strength and hardness.

Alloy steels are those in which *in addition to* carbon an alloying element is present in some appreciable quantity. They are divided into special alloy steels and *high-speed steels* which, in turn, are called *"self-hardening steels"*. Alloying elements of these steels are: nickel, chromium, manganese, molybdenum, *tungsten*, vanadium, etc. These alloying elements have a definite effect on the characteristic of the steel; nickel increases its strength and hardness; a high percentage of chromium makes steel *rust-resistant* and in this case it is called *"stainless steel"*. The addition of some tungsten and molybdenum gives heat-resistant steel. Vanadium makes steel corrosion, shock and vibration-resistant. The sand used for making moulds for steel castings differs greatly from that used in other branches of moulding. It must be much more *refractory* and open grained,[1] because the metal is poured at an extremely high temperature and solidifies very rapidly. If the sand is not refractory enough, it will *fuse* with the metal. The sand being not open grained, the gases will not escape from the mould rapidly enough, and blowholes will be formed in the casting. Many good steel castings are obtained with *green sand moulds*. Sand moulds are made by shaping the moulding sand around a *pattern* which is to have the same shape as the finished object, but their size should be a little larger as the steel casting shrinks while cooling. Moulding sand is to be mixed with water in a certain proportion. Many of the: smaller steel castings are used as they come from the moulds, but

most of the larger ones have to be annealed to relieve the cooling *strains* formed when the metal solidifies. Steel can be used for a great variety of castings, and it can be cast into very large bodies.

Cast steel parts enter into the make-up[2] of railroad equipment, agricultural machinery, and many other products where great strength is required. The tensile strength of steel castings is from 55,000 to 70,000 lbs. per square inch. Alloy steel castings are coming into more general use with each year, and they are influencing the manufacturing methods. It has been found possible to cast with this alloy some shapes that formerly were necessarily made in other ways. It is used in castings where the greatest strength is needed. Much research is being done to improve not only its strength, but also its wearing qualities. Castings are now produced that have a tensile strength from 70,000 to 150,000 lbs. per square inch, the strength depending upon the composition of the alloy and the method of heat treatment.

---

1. It must be much more refractory and open grained — он должен быть еще более огнестойким и крупнозернистым
2. make-up — состав

Exercise 1. Use the following words and phrases in sentences of your own:
to rust, alloying elements, to resist, to escape, stainless steel, carbon steel, machine steel, alloy steel, to fuse, corrosion, refractory, rust-resistant steel, heat-resistant steel, green sand moulds, pattern, strain

Exercise 2. Answer the following questions:
1. What is steel? 2. What are the main types of steel depending on the carbon content? 3. What steels are most widely used in industry? 4. What manufacturing purposes may tool steel be used for? 5. What is alloy steel? 6. What alloying elements can change the properties of alloy steel? 7. What sand is used for making steel castings? 8. Why must the pattern be a little larger than the casting which is to be produced? 9. What does the tensile: strength of steel depend on?

Exercise 3. Find in the text verbs for the following nouns:
division, casting, difference, fusion, solidification, improvement, requirement, production

Exercise 4. Translate the following sentences into Russian and observe the different ways of expressing obligation:
1. Steel has to be widely used in machine-building because of its high strength. 2. Alloy steel must be made by adding some alloying elements. 3. Tools made of high-speed steel may do the work at much higher speeds than carbon tool steels. 4. Chromium and tungsten are to increase the hardness and strength of steel. 5. High

carbon steel should be hardened by-beating it to a certain temperature and then quickly cooling in water. 6. Special alloy steels can be used for parts requiring great wear resistance.

Exercise 5. (a) Read and translate the following text without using a dictionary:

PRODUCTION OF STEEL

Converter steel is made from molten pig iron by forcing a blast of cold air under great pressure through the metal. The converter represents a large tank made of steel and covered with refractory bricks with an open top through which the molten metal is poured into the converter and out of it. When forcing the blast of cold air through the melted metal, the oxygen contained in the air combines with the carbon of the pig iron, and almost all the carbon in the metal is burned out. Steel made by this method is very cheap, but it is low grade steel because this method of producing steel cannot be well controlled.

Steel made in this way is called "Bessemer steel". One ton of such steel can be made in one minute.

(b) On the basis of the text make up three questions and answer them.

Non-ferrous metals

Non-ferrous metals are more expensive than ferrous metals and are used only when some characteristic not possessed by iron of steer is essential or desirable in application. These characteristics are: high electrical "and *thermal conductivity, high corrosion resistance, non-magnetic qualities,* light weight, etc. The metals most frequently used to make non-ferrous metal castings are *copper, tin, zinc, lead, nickel, gold* and *aluminium.* Some of the basic non-ferrous metals and their characteristics are described below.

Copper is a reddish-brown, tough metal. It has very high electric conductivity and high corrosion-resistant qualities. Copper is used for making electrical contacts and wires, pipes, telephone Cables, tanks, water heaters, etc. *Zinc*is a hard, brittle, bluish-white metal that is employed in the pure form as *sheet zinc.*

Lead is a very heavy bluish-grey metal/which is very soft. This metal is highly resistant to corrosion, but its strength is so low that it must be *supported* by a *core* of some other metal. Lead is used for *lining* pipes, acid tanks and *coating* electrical cables.

Aluminium is a soft, silvery white metal. It is light in weight, has high corrosion-resistant qualities and is used for automobile and airplane parts as well as for making different light-weight objects used in everyday life such as: frames, cooking utensils, chairs, etc.

Tin is a silvery, corrosion-resistant metal. Tin is hardly used in pure form, but is employed as an alloying element.

Nickel is a hard, tough, silvery metal. It has high corrosion-resistant qualities and is used for plating other metals such as iron or *brass.* There are many applications of non-ferrous metals in the unalloyed state, but in most cases, some alloying element is added.

The above-mentioned non-ferrous metals may be mixed in various proportions to form many alloys, chief among them being brasses, bronzes, and aluminium alloys. There is a wide range of use for non-ferrous alloys. Their nature differs greatly from that of the ferrous group. By varying the proportions of non-ferrous metals, alloys that are hard or soft, weak or strong, can be produced. When alloying, the metal with the highest melting point should be melted first, then the one with the next highest melting point, and so on until all of the metals that are to make up the alloy are melted together. For example, to make a red-brass alloy, the copper is melted first, then the zinc, then the lead, and at last the tin. As soon as the mixture is hot enough to run the castings, it should be taken out of the furnace, otherwise the zinc, tin and lead may burn away.

Brasses are yellowish or reddish alloys of copper and zinc in different proportions (about 60 per cent copper and 40 per cent zinc, but some brasses contain as high as 90 per cent copper with only 10 per cent zinc). An addition, of tin makes brasses stronger. Brasses are very *ductile* and may be treated without heating them. They are corrosion-resistant and are used for making musical instruments, *bearings.*

Bronze is an alloy containing primarily copper and tin, but other elements may be added to the alloy to increase ' its properties such as hardness and resistance to wear. The most common bronzes are known as *straight bronze,* phosphor bronze, and manganese bronze. Straight bronze is usually a mixture of copper and tin, but there are many bronzes that contain zinc and lead, especially the cheap mixtures. phosphor bronze may be made by adding a little phosphorus to the mixture. If phosphor tin is used and alloyed with the copper, better results will be obtained than if the phosphorus is mixed with the copper. Manganese bronze alloys are usually made by using both copper that contains from 5 to 15 per cent of manganese and copper that contains no manganese.

Aluminium Alloys. Aluminium is used extensively for castings that are; to be light in weight, light in colour, or that must not rust. Since aluminium is too soft for making castings, it is necessary to mix some other metals with it. The metals that alloy freely with aluminium are copper, zinc, and iron. Usually, where aluminium alloys are made, the aluminium predominates.

All non-ferrous castings will take a high polish and will not rust so easily as the ferrous metals, a characteristic that makes them especially useful in wet or damp places. Non-ferrous metals are rather expensive and therefore nowadays scientists try to replace them with some ferrous alloys of lower cost possessing the same properties.

Exercise 1. Use the following words and phrases in sentences of your own:
thermal, mixture, copper, coating, non-magnetic quality, tin, sheet zinc, lining, to support, lead, core, brass, bronze

Exercise 2. Retell the text giving answers to the following questions:
1. What ferrous metals do you know? 2. What are the main characteristics of non-ferrous metals? 3. What are the properties of copper and what is it used for? 4. What do you know about lead? 5. What purposes is aluminium used for? 6. What are the properties of other non-ferrous metals? 7. What metals are used for producing non-ferrous castings? 8. What do you know about brasses? 9. What do you know about bronzes? 10. What are the main properties of non-ferrous castings? 11. Why are attempts made to replace non-ferrous metals by ferrous ones?

Exercise 3. State the forms and functions of infinitives and translate the following sentences into Russian:
1. Some metals have *to be melted* at very high temperatures. 2. *To make* non-ferrous castings, such metals as zinc, lead, aluminium and others are melted together. 3. *To line* pipes and electrical cables such metal as lead is used. 4. One must add some tin *to make* brasses stronger. 5. Very few objects are made of pure tin, but it is used *to make* bronze, babbit, and other alloy metals. 6. Nickel is used for covering iron and brasses *to make* them look better. 7. Nickel does not rust and can *be polished* to a very bright, silvery finish. 8. *To increase* hardness and strength of cast copper some cold-working operations are performed.

Exercise 4. Translate the following sentences paying attention to the different meanings of the word make:
1. Addition of copper, zinc and iron *makes* aluminium stronger. 2. The Soviet *makes* of new cranes are well known all over the world. 3. The foreman *makes* the learners pay attention to the casting process.

Exercise *5*. Translate the following sentences into English using infinitive constructions.
Example: Для того чтобы увеличить производство металла, необходимо применить новые методы его выплавки. *To increase the* output of metal it is necessary *to apply* new methods of smelting.
Для того чтобы увеличить прочность бронзы и сопротивление на износ, к ее составу можно добавить, кроме меди и олова, некоторые другие элементы. 2. Фосфорную бронзу можно получить добавлением небольшого количества фосфора к смеси меди и олова. 3. В практике литейного производства цветные металлы стараются заменить более дешевыми ферросплавами, которые обладают такими же свойствами. 4. Алюминий используется для

изготовления различных предметов домашнего обихода. 5. Для того чтобы сделать железо коррозие-устойчивым, его можно покрыть никелем.

Exercise 6. Make up as many questions as possible on the basis of the following sentences:
1. Copper is used for making electrical contacts and wires because of its high electrical conductivity. 2. Aluminium possesses high corrosion-resistant qualities. 3. Non-ferrous castings differ greatly from ferrous ones. 4. Aluminium is extensively used for castings that are to be light in weight.

Exercise 7. Translate the following text in written form without using a dictionary:

Non-ferrous metals

The metals most frequently used to make non-ferrous castings are copper, tin, zinc, lead, and aluminium. These non-ferrous metals have better resistance to corrosion than steel and they are usually easier cast and worked. There are many applications of non-ferrous metals and only few manufactures or machines are made that do not require the service of some or other non-ferrous component. For most purposes the pure non-ferrous metals are too soft and other alloying elements have to be added to create particular physical properties as required by each application. For this purpose non-ferrous metals are mixed in various proportion to form different alloys, such as brasses, bronzes and aluminium alloys, which can be strong, weak, hard or soft. Their cost is considerably greater than that of carbon steel but less than of some of the alloy steels.

UNIT 6

Методическое обеспечение:
1.Видеофрагмент «7 Best Milling Machings 2018».
2. Видеофрагмент «Grinders».
3. Опорный конспект «Milling Machines».
4. Опорный конспект «Grinding Machines».
5. Опорный конспект «Lathe Machines».
6. Опорный конспект «Drilling Machines».
7. Задания для самоконтроля.
8. Вопросы для самоконтроля.

Machine-Tools

Active Vocabulary:

machine-tools - станки
electrically driven –с электроприводом
shape – форма
workpiece – деталь
accurate – точный
development – развитие
to allow – позволять, разрешать
interchangeable – взаимозаменяемый
facility – приспособление
relative – относительный
amount – количество
fluid – жидкость
to lubricate – смазывать
spark erosion – электроискровая обработка
discharge – разряд
by means of – посредством
beam – луч
drilling – сверление
flexible – гибкий
range – ассортимент, диапазон

Exercise 1. Read and translate the text:

Machine-tools are used to **shape** metals and other materials. The material to be **shaped** is called the **workpiece**. Most **machine-tools** are now **electrically driven**. **Machine-tools** with electrical drive are faster and more **accurate** than hand tools: they were an important element in the **development** of massproduction processes, as they **allowed** individual parts to be made in large numbers so as to be **interchangeable**.

All **machine-tools** have **facilities** for holding both the **workpiece** and the tool, and for accurately controlling the movement of the cutting tool **relative** to the **workpiece**. Most machining operations generate large **amounts** of heat, and use cooling **fluids** (usually a mixture of water and oils) for cooling and **lubrication**.

Machine-tools usually work materials mechanically but other machining methods have been developed lately. They include chemical machining, **spark erosion** to machine very hard materials to any shape **by means of** a continuous high-voltage spark (**discharge**) between an electrode and a **workpiece**. Other

machining methods include **drilling** using ultrasound, and cutting **by means of** a laser **beam**. Numerical control of **machine-tools** and **flexible** manufacturing systems have made it possible for complete systems of **machine-tools** to be used **flexibly** for the manufacture of a **range** of products.

Exercise 2. Make the summary of the text using following phrases:

1. The text explains …
2. The main function of machine-tools is …
3. At present most machine-tools are …
4. That's why they are …
5. Besides, all machine-tools have …
6. Finally, machine-tools usually work …
7. To sum it up, ….

Exercise 3. Using the suffixes -er, -able, -ly, -ment, -al, -ance, -ion, -ty build the words according to the model:

Model: equip (оборудование) – equipment

1. manufacture (производитель); 2. arrange (расположение); 3. suit (подходящий), 4. resist (сопротивление); 5. friction (фрикционные); 6. moderate (умеренно); 7. chemical (химический); 8. treat (обработка); 9. immerse (погружение); 10. proper (свойство); 11. span (гаечный ключ); 12. eliminate (устранение); 13. product (производство); 14. engine (инженер); 15. develop (развитие); 16. distinct (различие).

Active Vocabulary:

manufacture – производство
equipment – оборудование
minute – мелкий
jewel – драгоценный камень
aircraft – самолет
spindle – шпиндель
to impart – придавать, сообщать
rotary – вращательный
motion – движение
feed – подача
to rest – отдыхать, покоиться

frame – рама, корпус
cutter – резец, фреза, режущий инструмент
to rotate – вращать
lathe – токарный станок
to perform – исполнять, совершать
variety – разнообразие, множество
reaming – развертывание, раззенкование
tapping – нарезка резьбы метчиком
to employ – употреблять
adapter – держатель, соединительная муфта
drive – привод, передача
arrangement – устройство, расположение
gear – шестерня

Word combinations for connected reading:

drilling machine – сверлильный станок
sensitive drilling machine – сверлильный станок повышенной точности upright drilling machine – вертикально-сверлильный станок
radial drilling machine – радиально-сверлильный станок
multi-spindle machine – многошпиндельный станок
milling machine – фрезерный станок
bench lathe – верстальный станок
chucking lathe – патронный токарный станок
screw machine – винторезный станок
boring mill – расточный станок
crankshaft lathe – коленчатовальный станок
wheel lathe – колесотокарный станок
engine lathe – токарно-винторезный станок

Exercise 4. Read and translate the text:
The machine-tool is the principal **manufacturing equipment** in a machine shop. It is essential in the **manufacture** of every product from a giant turbine to **minute jewels** for **aircraft** instruments.

One of the simplest tools is the ordinary **drilling machine**. It consists of a **spindle** which **imparts rotary motion** to the drilling tool, mechanism for feeding the tool into the work, a table on which the work **rests**, and a **frame**.

The **drilling machines** (pic. A4.1) or drill presses are grouped into the following four classes: **sensitive**, **upright**, **radial** and **multi-spindle machines**.

A **milling machine** (pic. A4.2) is a machine-tool that removes metal as the work is fed against a **rotating cutter**.

The **lathe** (pic. A4.3) is a machine-tool which can **perform** a wide **variety** of operations. It is primarily used for turning and boring operations. In addition, the **lathe** can be used for **drilling**, **reaming**, **tapping** and, by **employing** suitable **adapters**, operations of milling and grinding may be carried out without difficulty.

The **lathe** is the oldest machine-tool, but it is still widely used.

There are many types of **lathes** that differ in their size, design, method of **drive**, **arrangement** of **gears** and purpose.

According to the character of work **performed**, the design and construction **lathes** are divided into the following types: **bench lathes**, **chucking lathes** and automatic lathes. There are also **screw machines**, **boring mills**, **crankshaft lathes**, **wheel lathes**, etc.

Exercise 5. Find in the text English equivalents for the following word combinations:

различаются по размеру; операции фрезерования и шлифования; расположение шестерен; широко используется; удаляет металл; для подачи инструмента; гигантская турбина; придает вращательное движение.

Exercise 6. Answer the questions to the text B:

1. What is the machine-tool?
2. Where are machine-tools used?
3. What parts does the ordinary drilling machine consist of?
4. What types of drilling machines do you know?
5. What machine-tool removes metal with a rotating cutter?
6. What operations can the lathe be used for?
7. What are the main types of lathes?
8. What do many types of lathes differ in?

Exercise 7. Complete the sentences choosing appropriate variants from the box:

their size, design, method of drive, arrangement of gears and purpose; the oldest machine-tool; removes metal; drilling, reaming, tapping; sensitive, upright, radial and multi-spindle machines; the lathe; drilling machine

1. … consists of a spindle which imparts rotary motion to the drilling tool, mechanism for feeding the tool into the work, a table on which the work rests, and a frame.

2. The milling machine is a machine-tool that … as the work is fed against a rotating cutter.
3. … is used for turning and boring operations.
4. The lathe is still widely used in spite of it is … .
5. Lathes differ in … .
6. The lathe can be used for … .
7. The drilling machines are divided into four classes … .

Exercise 8. Translate into English:

1. Станок – необходимое в производстве оборудование.
2. Сверлильный станок – простейший станок.
3. Сверлильный станок состоит из шпинделя, механизма по подаче инструмента к детали, стола и рамы.
4. Деталь лежит на столе.
5. Сверло вращается при помощи шпинделя.
6. Фрезерный станок удаляет металл с детали с помощью фрезы.
7. Токарный станок используется для сверления, развертывания и нарезки резьбы метчиком.
8. Фрезерование и шлифование проходят без особых трудностей.

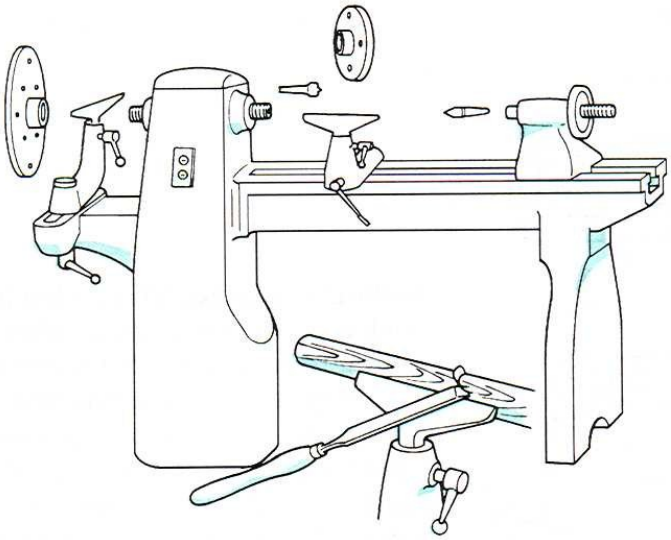
Lathes

Vocabulary

lathe – токарный станок
circular cross-section – круглое поперечное сечение
surface – поверхность
stationary – неподвижный, стационарный
sideways – в сторону
variety – разнообразие,
depth – глубина
headstock – передняя бабка
spindle – шпиндель
chuck – зажим, патрон
faceplate – планшайба
lathe bed – станина станка
to enable – давать возможность
tolerance – допуск

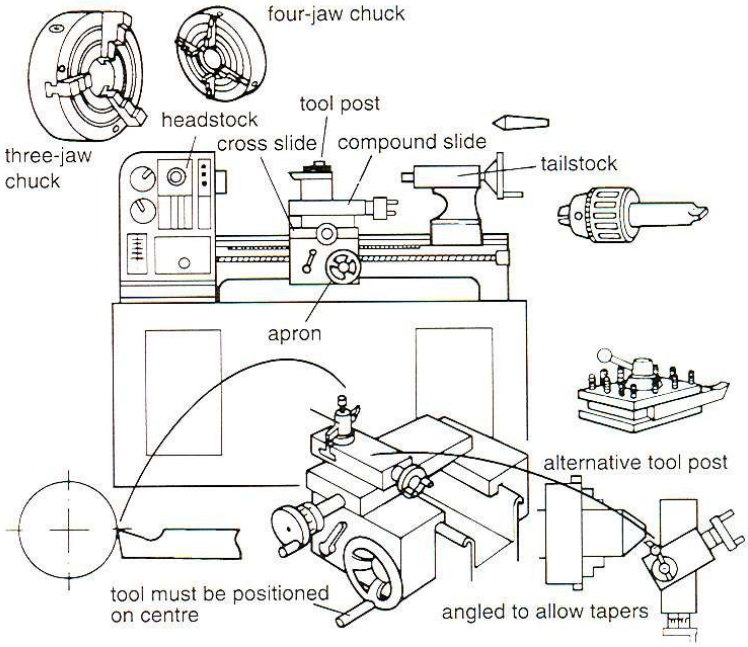
Exercise 9. Read and translate the text:

Lathe is still the most important machine-tool. It produces parts of circular cross-section by turning the workpiece on its axis and cutting its **surface** with a sharp **stationary** tool. The tool may be moved **sideways** to produce a cylindrical part and moved towards the workpiece to control the **depth** of cut. Nowadays all lathes are power-driven by electric motors. That allows continuous rotation of the workpiece at a variety of speeds. The modern lathe is driven by means of a **headstock** supporting a hollow **spindle** on accurate bearings and carrying either a **chuck** or a **faceplate**, to which the workpiece is clamped. The movement of the tool, both along the **lathe bed** and at right angle to it, can be accurately controlled, so **enabling** a part to be machined to close **tolerances**. Modern lathes are often under numerical control.



Wood turning lathe. This machine is used to make circular objects, such as table legs and wooden bowls. The work is either held on a face plate or supported between centres. Small work can be held in a chuck. The turning tools are rather like gouges and chisels, but the handles are longer to allow a firmer grip.

Centre lathe. The centre lathe is the most versatile of all the machines used for working rigid materials. It can be used to manufacture a wide variety of shapes. The work is normally held in a chuck and if it is long, it is supported at the other end in a centre. A wide range of cutting tools is available, but they must all be sharpened and positioned carefully to get the best results.



Exercise 10. General understanding:

1. What are machine-tools used for?
2. How are most machine-tools driven nowadays?
3. What facilities have all machine-tools?
4. How are the cutting tool and the workpiece cooled during machining?
5. What other machining methods have been developed lately?
6. What systems are used now for the manufacture of a range of products without the use of manual labour?
7. What parts can be made with lathes?
8. How can the cutting tool be moved on a lathe?

9. How is the workpiece clamped in a lathe?
10. Can we change the speeds of workpiece rotation in a lathe?
11. What is numerical control of machine tools used for?

Exercise 11. Find the following words and word combinations in the text:

1. обрабатываемый материал
2. электропривод
3. более точный
4. отдельные детали
5. процесс массового производства
6. приспособления для держания резца и детали
7. операции по механической обработке детали
8. высоковольтный разряд
9. сверление ультразвуком
10. резание с помощью лазерного луча
11. гибкие производственные системы
12. детали круглого сечения
13. поворачивать деталь вокруг ее оси
14. двигать в сторону, двигать по направлению к детали
15. глубина резания
16. непрерывное вращение детали
17. движение резца вдоль станины

Exercise 12. Translate into English:

1. Токарный станок позволяет производить детали круглого сечения.
2. Деталь зажимается в патроне или на планшайбе токарного станка.
3. Резец может двигаться как вдоль станины, так и под прямым углом к ней.
4. Современные токарные станки часто имеют цифровое управление.

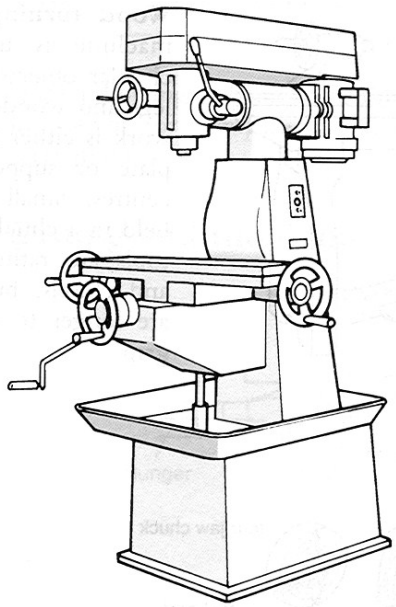
Milling machines

Vocabulary

milling machine – фрезерный станок
series – серия, ряд
cutting edge – режущий край, острие
circumference – окружность
to feed – подавать
longitudinal – продольный
horizontal – горизонтальный
vertical – вертикальный
versatile – универсальный
flat – плоский
contoured – контурный
angle – угол
slot – прорезь, паз
gear teeth – зубы шестерни
drill – дрель, сверло, сверлить
hole – отверстие
to enlarge – увеличивать
thread – резьба
portable – портативный
unit – единица, целое, узел
previously – ранее
to slide – скользить
stroke – ход
lateral – боковой
displacement – смещение
straight – прямой
idle – на холостом ходу
workshop – цех, мастерская
to mount – крепить
holder – держатель
to execute – выполнять
simultaneous – одновременный
multiple – многочисленный
grinder – шлифовальный станок
wheel – круг, колесо
bonded – скрепленный

to remove – удалять
pass – проход
fine – точный
conventional – обычный
device – устройство, прибор
fragile – хрупкий

In a **milling machine** the **cutter** (фреза) is a circular device with **a series** of cutting **edges** on its **circumference**. The workpiece is held on a table that controls the **feed** against the cutter. The table has three possible movements: **longitudinal**, **horizontal**, and **vertical**; in some cases it can also rotate. Milling machines are the most **versatile** of all machine tools. **Flat or contoured** surfaces may be machined with excellent finish and accuracy. **Angles**, **slots**, **gear teeth** and **cuts** can be made by using various shapes of cutters.



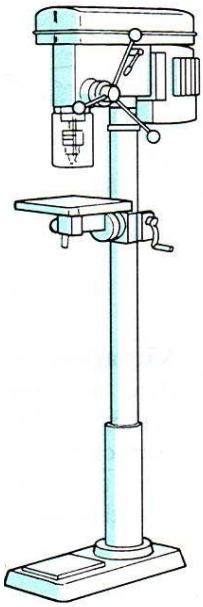
Milling machine. Many schools have a milling machine and it can be used either with the cutter vertical or horizontal. For safety reasons, schools frequently use a milling machine with the cutter vertical. It can be used to produce flat surfaces, rebates and slots. It is best used on metals and plastics, but if used on thermoplastics the heat produced can often cause melting, so it is useful to keep the job cool with soluble oil.

Drilling and Boring Machines

To drill a **hole** usually hole-making machine-tools are used. They can drill a hole according to some specification, they can **enlarge** it, or they can cut **threads** for a screw or to create an accurate size or a smooth finish of a hole.

Drilling machines (сверлильные станки) are different in size and function, from **portable drills** to radial drilling machines, multispindle **units**, automatic production machines, and deep-hole-drilling machines.

Boring (расточка) is a process that enlarges holes **previously** drilled, usually with a rotating single-point cutter held on a boring bar and fed against a stationary workpiece.



Pillar drilling machine. When using a pillar drilling machine for drilling holes in metals you must be careful to avoid the swarf (chippings or strands of metal) that come from the hole. These can be very sharp. One way of ensuring that your hands are kept away from the swarf is to clamp the work securely.

Shapers and Planers

The shaper (поперечно-строгальный станок) is used mainly to produce different flat surfaces. The tool **slides** against the stationary workpiece and cuts on one **stroke**, returns to its starting position, and then cuts on the next stroke after a slight **lateral displacement**. In general, the shaper can make any surface having **straight-line** elements. It uses only one cutting-tool and is relatively slow, because the return stroke is **idle**. That is why the shaper is seldom found on a mass production line. It is, however, valuable for tool production and for **workshops** where flexibility is important and relative slowness is unimportant.

The **planer** (продольно-строгальный станок) is the largest of the reciprocating machine tools. It differs from the shaper, which moves a tool past a fixed workpiece because the planer moves the workpiece to expose a new section to the tool. Like the shaper, the planer is intended to produce vertical, horizontal, or diagonal cuts. It is also possible to **mount** several tools at one time in any or all tool **holders** of a planer to **execute multiple simultaneous** cuts.

Grinders

Grinders (шлифовальные станки) **remove** metal by a rotating abrasive **wheel**. The wheel is composed of many small grains of abrasive, **bonded** together, with each grain acting as a miniature cutting tool. The process gives very smooth and accurate finishes. Only a small amount of material is **removed** at each **pass** of the wheel, so grinding machines require **fine** wheel regulation. The pressure of the wheel against the workpiece is usually very light, so that grinding can be carried out on **fragile** materials that cannot be machined by other **conventional devices**.

Exercise 1. General understanding:

1. What is the shape of a cutter in a milling machine?
2. What moves in a milling machine, a table or a cutter?
3. What possible movements has the table of a milling machine?
4. What kind of surfaces and shapes may be machined by a milling machine?
5. What can we use a drilling machine for?
6. What kinds of drilling machines exist?
7. What is rotated while boring, a cutter or a work-piece?
8. Describe the work of a shaper (planer).
9. What must be done to execute multiple simultaneous cuts on a planer?
10. What is the working tool in a grinder?
11. Can we obtain a very smooth surface after grinding and why?
12. Can we grind fragile materials and why?

Exercise 2. Translate into English:

1.Токарный станок все еще остается самым важным станком.

2.Все современные токарные станки оборудованы электроприводами.

3.Движение инструмента контролируется с высокой точностью.

4.Электропривод позволяет обрабатывать заготовку на различных скоростях.

Workshop

Exercise 1. Read and translate the text

To achieve the success in the field of job for an engineer, it is necessary to know the application of theory knowledge which is done in practice of workshop practical. Sound knowledge of workshop practical makes students a high class

quality of working . Workshop is active and effective part of technical education. The manufacturing process depends upon the type of job. Generally, the job includes raw material, cutting, drilling, turning & facing, milling & parting off, inspection.

The workshop of our college is big. It is a big, long room with five windows. It is equipped with machine-tools, benches, different tools and instruments. The machine-tools are on the left: lathes, milling machines. The safety-notice is on the wall on the right.

There is a toolboard above the bench. Many tools are on the toolboard. There are chisels, screwdrivers, a pair of pliers, a set of spanners, files.

There are many nails, nuts and screws on the shelf. They are large and small. The hammer is not on the shelf, it is on the bench.

Our students have practice in this workshop. We get the professions of a lathe operator - a turner, a milling operator and so on.

Vocabulary

Workshop - мастерская, цех
Equipped - оборудован
machine-tool - станок
bench - верстак
tool – инструмент
instrument - прибор, аппарат, инструмент
on the left – слева
on the right - справа
lathe – токарный станок
milling machine - фрезерный станок
safety-notice–инструкция по технике безопасности
tool board – доска для инструментов
chisel - долото, стамеска
screwdriver - отвёртка
a pair of pliers – плоскогубцы
a set of spanners – набор гаечных ключей
files – напильники
nail - гвоздь
nut – гайка
screw – винт, шуруп
shelf – полка
hammer – молоток
practice – практика
a turner – токарь
a milling operator – фрезеровщик

foreman - мастер

Exercise 2. Answer the questions given below:

1. This is a workshop, isn't it?
2. Where is the toolboard?
3. Where are the tools?
4. What are they?
5. Are machine-tools on the right or on the left?
6. The hammer is not on the shelf, is it?
7. What professions do our students get in this workshop?
8. What machine-tools are there in the workshop?
9. Where can you find a safety-notice in our workshop?

Exercise 3. Read the dialogue.

A: How do you do? I'm Jack Wilson, a journalist from "The Times".
B: How do you do, Mr. Wilson. My name is ....
A: What do you do?
B: I am a foreman.
A: Where do you work?
B: I work at the workshop of the Minsk machine-building college.
A: A workshop at the college? It is very interesting.
B: Yes, our students have practice in our workshop.
A: Is your workshop well-equipped?
B: Oh yes, it is a big room. There are many machine-tools on the left and there is a safety-notice, a bench and a tool board on the right on the wall.
A: What machine-tools are there in your workshop?
B: In our workshop there are milling machines, drilling machines, grinding machines and lathes.
A: Do the students like to work on machine-tools?
B: Yes, they do, very much.
A: Thank you for the interview. I was glad to meet you.
B: I was glad to meet you, too.

Exercise 4. Ask your partner about the location of the objects below. Use different ways of expressing your opinion.

EXAMPLE: the nails/ in the packet/ in the box
-The nails are in the packet, aren't they? -No, I think they are in the box.

1. The instruments/ on the table/ in the toolbox
2. A pair of pliers/ on the toolboard/ on the shelf
3. A set of chisels/ to the right of the files/ to the left of the files
4. The switches/ above the bench/ under the bench

5. The nuts/ among the nails/ among the screws

Exercise 5. You are in the workshop. Ask your friend to bring the tools you need. You may start like this.

A: Give me some nails, please.
B: What nails? Big or small?
A: The biggest ones.
B: Where are they?
A: Well, I think they are in the box.
B: No, they are in the drawer. Here you are,
A: Thanks. Now give me, please,...

Exercise 6. Describe the workshop of your college.

UNIT 7

Методическое обеспечение:

1. Видеофрагмент «What is Manufacturing Process?».
2. Видеофрагмент «Manufacturing Capabilities».
3. Видеофрагмент «Fundamentals of Manufacturing Processes».
4. Опорный конспект « Types of Manufacturing Processes».
5. Опорный конспект «Basic Metalworking Processes».
6. Задания для самоконтроля.
7. Вопросы для самоконтроля.

Manufacturing and Technological Processes

Exercise 1. Read the text. Translate it.

What is Manufacturing Process?

Manufacturing process is basically a complex activity, concerned with people who've a broad number of disciplines and expertise and a wide range of machinery, tools, and equipment with numerous levels of automation, such as computers, robots, and other equipment. Manufacturing pursuits must be receptive to several needs and developments.

Beside above, all the future technicians must understand the basic needs of workshop routines in terms of man, equipment, material, methods, revenue and other infrastructure conveniences needed to be placed properly for maximum shop

or plant layouts and other support solutions effectively regulated or positioned in the field or industry within a properly planned manufacturing firm.

Meaning

The complete knowledge of fundamental workshop technology and manufacturing processes is highly troublesome for anybody to claim competence over it. It deals with numerous aspects of workshops procedures also for providing the basic working awareness of the various engineering materials, tools, accessories, manufacturing processes, basic concepts of machine instruments, production criteria's, traits and uses of numerous testing instruments and calibrating or inspecting units for checking materials or products designed in various production shops in a commercial environment. It also explains and illustrates the use of several hand tools (calibrating, marking, forming and supporting gear etc.), tools, machinery and diverse methods of production that facilitate forming or shaping the existing raw materials into appropriate usable forms. Below are some of the manufacturing processes that are worth reading.

Types of Manufacturing Processes

There are the 4 types of manufacturing processes.

Machining

Tools used for machining are immobile power-driven units used to form or shape solid materials, specifically metals. The forming is done by removing extra materials from a work-piece. Machine tools make up the foundation of advanced industry and are utilized either indirectly or directly in the manufacturing of tool parts.

They are categorized under three main categories:

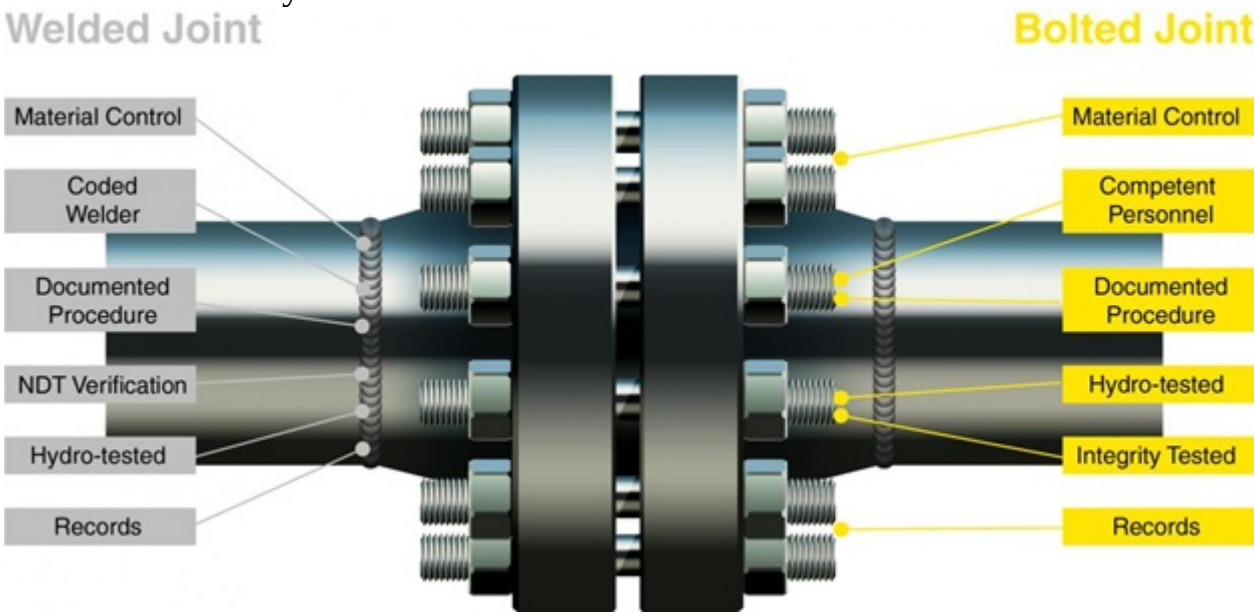
1. Traditional Chip-making tools.
2. Presses.
3. Modern machine tools.

Traditional chip-making tools form the work-piece by trimming away the unwanted part accessible as chips. Presses implement a several shaping processes, which includes shearing, pressing, or elongating. Non-traditional machine tools implement light, electric powered, chemical, and sonic power; superheated gas; and high-energy compound beams to form the exotic supplies and materials that have been created to meet the requirements of modern technology.

Joining

Every joining approach has particular design needs, while certain joint needs may propose a particular joining approach. Design for assembly, and fastener selection apply their own specifications.

Bolting is a standard fastening method, for instance, but welding may cut down the weight of assemblies. Naturally, joints intended for the two approaches would differ tremendously.



However, all joint patterns must consider features such as load factors, assembly effectiveness, operating surroundings, overhaul and upkeep, and the materials chosen.

Welding is generally a cost-effective approach to fabricate. It doesn't require overlapping materials, and so it removes excess weight brought on by other fastening methods. Fasteners don't have to be purchased and stored in stock. Welding also can minimize costs related to extra parts, for example angles mounted between parts.

Forming

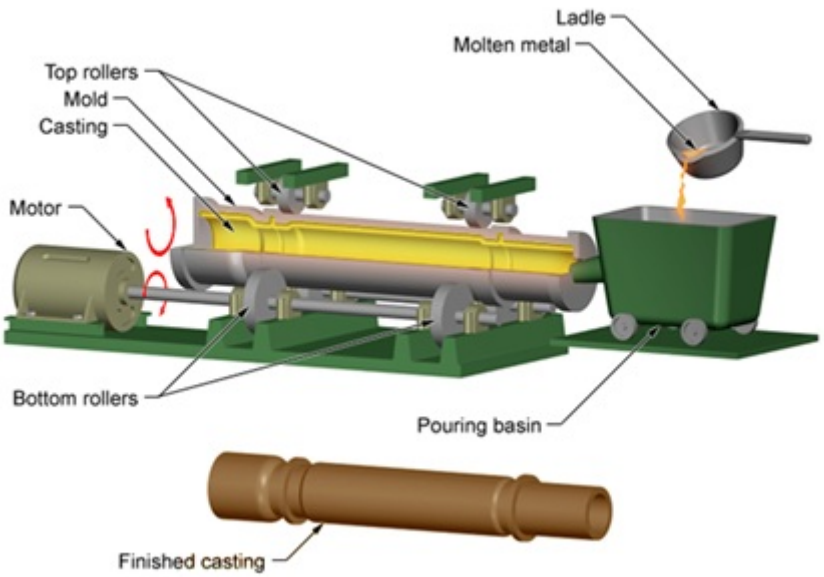
Metal forming is the approach of creating the metallic components by deforming the metal but not by removing, cutting, shredding or breaking any part. Bending, spinning, drawing, and stretching are a few important metal forming process in manufacturing. The metal press such as die and punching tools are implemented for this manufacturing process.

Advantages: – Same equipment can be utilized for manufacturing various components by simply changing the dies.

Disadvantages: – High apparatus and tooling expenses. – Heat treatment must be applied afterwards.

Casting

Casting is a manufacturing process in which a solid is dissolved into a liquid, heated to appropriate temperature (sometimes processed to change its chemical formula), and is then added into a mold or cavity. Thus, in just one step, complex or simple shapes can be crafted from any kind of metal that has the capability to be melted. The end product can have practically any arrangement the designer wants.



Furthermore, the reluctance to working challenges can be improved, directional attributes can be managed, and a pleasing look can be developed.

Exercise 2. Answer the questions:

1 What is Manufacturing Process?
2 What are 4 types of manufacturing processes?
3 What tools are used for machining?

4 How do they choose a joining method?
5 What is metal forming for?
6 Is casting a manufacturing process?

Classification of Engineering Manufacturing Processes

It is difficult to classify the exact number of **various engineering manufacturing processes** existing and are being practiced presently because a spectacularly large number of processes have been developed till now and the number is still increasing exponentially every year with the growing demands and rapid progress in science and technology in the manufacturing field.

However, all such manufacturing processes can be broadly classified into four major groups as follows:

Shaping or forming process

Manufacturing a solid product of definite size and shape from a given material taken in three possible states:

- In solid state – e.g., forging, rolling, extrusion, drawing etc.
- In liquid or semi-liquid state – e.g., casting, injection molding etc.
- In powder form – e.g., powder metallurgical process.

Joining process

It includes welding, brazing, soldering etc.

Removal process

It includes machining (Traditional or Non-traditional), Grinding etc.

Regenerative manufacturing process

Production of solid products in layer by layer from raw materials in a different form:

- Liquid – e.g., Stereolithography
- Powder – e.g., Selective sintering
- Sheet – e.g., LOM (Laminated Object Manufacturing)
- Wire – e.g., FDM. (Fused Deposition Modelling)

Out of the above-stated groups, Regenerative Manufacturing is the latest one which is generally accomplished very rapidly and quite accurately using Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM)for Rapid Prototyping and Tooling.

Metalworkng processes

Vocabulary:

useful — полезный
shape — форма, формировать
rolling — прокатка
extrusion — экструзия, выдавливание
drawing — волочение
forging — ковка
sheet — лист
to subject — подвергать
amount — количество
condition — состояние, условие
perform — выполнять, проводить
to harden — делаться твердым, упрочняться
at least — по крайней мере
common — общий
billet — заготовка, болванка
orifice — отверстие
billet — заготовка, болванка
orifice — отверстие
die — штамп, пуансон, матрица, фильера, волочильная доска
cross section — поперечное сечение
window frame — рама окна
tube — труба
hollow — полый
initial — первоначальный, начальный
thick-walled — толстостенный
mandrel — оправка, сердечник
impact — удар
loosely — свободно, с зазором
fitting — зд. посадка
gap — промежуток, зазор
to determine — устанавливать, определять

Exercise 1. Read the text.

Metals are important in industry because they can be easily deformed into **useful shapes.** A lot of metalworking processes have been developed for certain applications. They can be divided into five broad groups:

1. rolling,

2. extrusion,
3. drawing,
4. forging,
5. sheet-metal forming.

During the first four processes metal is **subjected** to large **amounts** of strain (deformation). But if deformation goes at a high temperature, the metal will recrystallize — that is, new strain-free grains will grow instead of deformed grains. For this reason metals are usually rolled, extruded, drawn, or forged above their recrystallization temperature. This is called hot working. Under these **conditions** there is no limit to the compressive plastic strain to which the metal can be subjected.

Other processes are **performed** below the recrystallization temperature. These are called cold working. Cold working **hardens** metal and makes the part stronger. However, there is a limit to the strain before a cold part cracks.

Rolling

Rolling is the most common metalworking process. More than 90 percent of the aluminum, steel and copper produced is rolled **at least** once in the course of production. The most **common** rolled product is **sheet.** Rolling can be done either hot or cold. If the rolling is finished cold, the surface will be smoother and the product stronger.

Extrusion

Extrusion is pushing the billet to flow through the orifice of a die. Products may have either a simple or a complex cross section. Aluminum window frames are the examples of complex extrusions.

Tubes or other **hollow** parts can also be extruded. The **initial** piece is a **thick-walled** tube, and the extruded part is shaped between a die on the outside of the tube and a **mandrel** held on the inside.

In impact extrusion (also called back-extrusion) (штамповка выдавливанием), the workpiece is placed in the bottom of a hole and a **loosely fitting ram** is pushed against it. The ram **forces** the metal to flow back around it, with the **gap** between the ram and the die **determining** the wall thickness. The example of this process is the manufacturing of aluminum beer cans.

Exercise 2. Answer the questions.

1. Why are metals so important in industry?
2. What are the main metalworking processes?
3. Why are metals worked mostly hot?
4. What properties does cold working give to metals?
5. What is rolling? Where is it used?
6. What is extrusion? What shapes can be obtained after extrusion?
7. What are the types of extrusion?

Exercise 3. Find the following in the text:

1. могут легко деформироваться
2. нужные формы
3. подвергать большим деформациям
4. зерна свободные от деформации
5. температура перекристаллизации
6. пластическая деформация сжатия
7. самый обычный процесс обработки металла
8. самое обычное изделие проката
9. отверстие фильеры
10. первоначальный
11. сложное сечение
12. пустотелые детали
13. свободно входящий плунжер
14. зазор между плунжером (пуансоном) и штампом
15. толщина стенки

Exercise 4. Translate into English:

1. Способность металла перекристаллизовываться при высокой температуре используется при горячей обработке.
2. Перекристаллизация — это рост новых, свободных от деформации зерен.
3. Во время горячей обработки металл может подвергаться очень большой пластической деформации сжатия.
4. Холодная обработка делает металл тверже и прочнее, но некоторые металлы имеют предел деформации.
5. Листовой прокат может производиться горячим или холодным.
6. Поверхность холоднокатаного листа более гладкая и он прочнее.
7. Поперечное сечение фильеры для экструзии может быть простым или сложным.
8. Алюминиевые и медные сплавы являются наилучшими для экструзии из-за их пластичности при деформации.
9. Алюминиевые банки, тюбики для зубной пасты являются примерами использования штамповки выдавливанием.
10. Толщина стенки алюминиевой банки определяется зазором между пунсоном и штампом.

Vocabulary:

to pull — тянуть
reduction — сокращение

to achieve — достигать
in series — серия, последовательно
beyond — выше, свыше
yield point — точка текучести металла
to retain — сохранять, удерживать
to bend — гнуть
shearing — обрезка, отрезание
edge — край
to grip — схватывать
lower die — нижний штамп
upper die — верхний штамп
forming operation — операция штампования
dimension — измерение, размеры
required — необходимый
increase — увеличение
open-die forging — ковка в открытом штампе (подкладном)
hammering — ковка, колотить
within — внутри, в пределах
to enclose — заключать
rod — прут, стержень
bar — прут, брусок
involved — включенный
tolerance — допуск
upsetting — высадка, выдавливание

blow — удар
coining — чеканка
imprint — отпечаток
clamp — зажим
to hit — ударять

Exercise 5. Read the text.

Drawing

Drawing consists of **pulling** metal through a die. One type is wire drawing. The diameter **reduction** that can be **achieved** in one die is limited, but several dies **in series** can be used to get the desired reduction.

Sheet metal forming

Sheet metal forming (штамповка листового металла) is widely used when parts of certain shape and size are needed. It includes forging, bending and shearing.

One characteristic of sheet metal forming is that the thickness of the sheet changes little in processing. The metal is stretched just **beyond** its **yield point** (2 to 4 percent strain) in order to **retain** the new shape. **Bending** can be done by pressing between two dies. **Shearing** is **a** cutting operation similar to that used for cloth.

Each of these processes may be used alone, but often all three are used on one part. For example, to make the roof of an automobile from a flat sheet, the **edges** are **gripped** and the piece pulled in tension over a **lower die.** Next an **upper die** is pressed over the top, finishing the **forming operation** (штамповку), and finally the edges are sheared off to give the final **dimensions.**

Forging

Forging is the shaping of a piece of metal by pushing with open or closed dies. It is usually done hot in order to reduce the **required** force and **increase** the metal's plasticity.

Open-die forging is usually done by **hammering** a part between two flat faces. It is used to make parts that are too big to be formed in a closed die or in cases where only a few parts are to be made. The earliest forging machines lifted a large hammer that was then dropped on the workpiece, but now air or steam hammers are used, since they allow greater control over the force and the rate of forming. The part is shaped by moving or turning it between blows.

Closed-die forging is the shaping of hot metal **within** the walls of two dies that come together to **enclose** the workpiece on all sides. The process starts with a **rod or bar** cut to the length needed to fill the die. Since large, complex shapes and large strains are **involved,** several dies may be used to go from the initial bar to the final shape. With closed dies, parts can be made to close **tolerances** so that little finish machining is required.

Two closed-die forging operations are given special names. They are **upsetting** and **coining.** Coining takes its name from the final stage of forming metal coins, where the desired **imprint** is formed on a metal disk that is pressed in a closed die. Coining involves small strains and is done cold. Upsetting involves a flow of the metal back upon itself. An example of this process is the pushing of a short length of a rod through a hole, **clamping** the rod, and then **hitting** the exposed length with a die to form the head of a **nail or bolt.**

Exercise 6. Answer the questions.

1. How can the reduction of diameter in wire drawing be achieved?
2. What is sheet metal forming and where it can be used?
3. What is close-die forging?
4. What is forging?

8. What process is used in wire production?
9. Describe the process of making the roof of a car.

Exercise 7. Find the following word combinations in the text:

1. протягивание металла через фильеру
2. волочение проволоки
3. уменьшение диаметра
4. толщина листа
5. растягивать выше точки текучести
6. сохранить новую форму
7. края отрезаются
8. конечные размеры
9. уменьшить необходимое усилие
10. увеличить пластичность металла
11. воздушные или паровые молоты
12. сила и скорость штампования
13. внутри стенок двух штампов
14. отделочная обработка
15. малые допуски

Exercise 8. Translate into English:

1. При волочении проволоки диаметр отверстия волочильной доски каждый раз уменьшается.
2. Штамповка листового металла включает в себя ковку, изгиб и обрезку.
3. Небольшая деформация листа при растяжении помогает сохранить новую форму детали.
4. Изменение формы при штамповке производится путем сжатия между двумя штампами.
5. Края листа при штамповке отрезаются для получения конечных размеров.
6. При проковке деталь должна быть горячей для уменьшения необходимых усилий и увеличения пластичности металла.
7. После ковки в закрытых штампах детали не требуют большой механической обработки.
8. При чеканке деформация металла невелика и отпечаток формируется на поверхности металла.
9. Высадка используется для изготовления головок гвоздей и болтов.

Metal cutting

Cutting is one of the oldest arts practiced in the stone age, but the cutting of metals was not found possible until the 18th century, and its detailed study started about a hundred years ago.

Now in every machine-shop you may find many machines for working metal parts, these cutting machines are generally called machine-tools and are extensively used in many branches of engineering. Fundamentally all machine-tools remove metal and can be divided into the following categories:

1. Turning machines (lathes).
2. Drilling machines.
3. Boring machines.
4. Milling machines.
5. Grinding machines.

Machining of large-volume production parts is best accomplished by screw machines. These machines can do turning, threading, facing, boring and many other operations. Machining can produce symmetrical shapes with smooth surfaces and dimensional accuracies not generally attainable by most fabrication methods.

Screw-machined parts are made from bar stock or tubing fed intermittently and automatically through rapidly rotating hollow spindles. The cutting tools are held on turrets and tool slides convenient to the cutting locations. Operations are controlled by cams or linkages that position the work, feed the tools, hold them in position for the proper time, and then retract the tools. Finished pieces are automatically separated from the raw stock and dropped into a container.

Bushings, bearings, nuts, bolts, studs, shafts and many other simple and complex shapes are among the thousands of products produced on screw machines. Screw machining is also used to finish shapes produced by other forming and shaping processes.

Most materials and their alloys can be machined — some with ease, others with difficulty. Machinability involves three factors: 1. Ease of chip removal. 2. Ease of obtaining a good surface finish. 3. Ease of obtaining good tool life.

Exercise 1. Complete the table:

Название станка		Операция	
1. lathe (turning machine)	токарный станок	turning	обточка
2.		drilling	
3.			расточка
4. grinding			

machine			
5.	винторезный станок		
6.		milling	
7. cutting machine			

Exercise 2. Complete the sentences choosing the suitable part from the second column. Translate them.

1. There are...
2. They are...
3. These machine-tools can perform...
4. Finished parts possess...
5. A lot of simple and complex shapes...
6. Screw-machining is also used...
7. Most engineering materials can be machined...

a) symmetrical shapes, high dimensional accuracies and smooth surfaces.
b) for finishing operations.
c) five general categories of machine-tools.
d) can be produced on screw machines.
e) turning, milling, grinding, boring, etc. operations.
f) by machine-tools.
g) lathes, drilling, boring, milling and grinding machines.

Exercise 3. Answer the questions to the text "Metal Cutting".
1. When did the study of metal cutting start? 2. What is the purpose of metal cutting? 3. What machines are called "machine-tools"? 4. List the general categories of machine-tools. 5. What is the function of the spindle? 6. Where are cutting tools held? 7. By what means are cutting operations controlled? 8. List products produced on screw machines. 9. What are the general advantages of machining over other fabrication methods?

Milling

Active Vocabulary:
milling – фрезерование, измельчение
to remove – удалять
essential – существенный, неотъемлемый
feature – особенность, характерная черта
spindle – шпиндель
multiple – многочисленный
slot – прорезь, паз, щель
groove – выемка, желобок, паз
casting – отливка, литье
to mount – крепить, держать
knee – колено, подкос
jack – домкрат
screw – винт
saddle – суппорт, опора, скоба
slide – скольжение
guide – приспособление, передаточный рычаг
angle – угол
edge – край, лезвие
axis – ось

Exercise 1. Find the Russian equivalents for the following word combinations:

1. the process of removal metal	a. движение детали
2. a rotating multipoint cutter	b. процесс удаления (снятия) металла
3. relative to the cutting surface	c. могут условно относиться
4. can be conventionally regarded	d. вращение фрезы
5. the rotation of a cutter	e. число оборотов шпинделя в минуту
6. the moment of the work	f. относительно режущей поверхности
7. the number of spindle revolutions per minute	g. вращающаяся многозубая фреза

Word combinations for connected reading:

milling machines – фрезерные станки
rotating cutters – вращающиеся фрезы

power-driven table – столик с механическим приводом
multiple-toothed cutters – многозубчатые фрезы
gear drive – шестеренчатый привод
feed gear-box – зубчатая коробка передач
V-guide – V-образная направляющая
jack screw – домкратный винт
on the top of the knee – на верху кронштейна
at right angles – под прямыми углами
relative to – относительно
is permanently fixed – постоянно закреплен
is amounted on an arbor – смонтированный на шпинделе
spacing washers and locking nuts – распорные шайбы и зажимные гайки
slide and face cutter – боковая и лобовая фреза
cutting edges on both slides and on periphery – режущие кромки по бокам и на периферии
in the form of helix about the axis of rotation – в форме спирали по оси вращения

Exercise 2. Read and translate the text:

Milling is the process of removing metal with rotating cutters.

The essential features of most milling machines are a power-driven table on which the work is done and a spindle carrying one or more multiple-toothed cutters, slots or grooves.

The horizontal milling machine consists of a main casting in which the spindle and its gear drive and the gear-box are mounted. On the front of this casting is a vertical V-guide on which the knee is mounted. The knee is raised or lowered by a telescopic jack screw. A saddle slides from front to back on Vguides on the top of the knee. The work table is mounted in V-guides on the saddle. The table is provided with movement in two directions at right angles to each other in the horizontal plane, and with vertical movement relative to the cutter, whose height is permanently fixed.

The cutter is mounted on an arbor and held in the desired position by spacing washers and a locking nut.

The type of a cutter mainly used on the horizontal miller is what is known as a slide and face cutter, that is, a cutter provided with cutting edges on both sides and on periphery. For large flat surfaces, roller milling cutters are used, having cutting edges in the form of helix about the axis of rotation.

Exercise 3. Find in the text English equivalents for the following word combinations:

суппорт скользит; процесс удаления металла; характерные черты (особенности); шпиндель крепится; постоянно зафиксирована; поднимается или опускается при помощи домкратного винта; плоские поверхности; движение в двух направлениях; вертикальный V-образный передаточный рычаг; режущие края; многозубчатые фрезы.

Exercise 4. Answer the questions to the text:

1. What is milling?
2. What are the essential features of most milling machines?
3. What does the horizontal milling machine consist of?
4. What is there on the front of the casting?
5. What is mounted on the casting?
6. What is knee moved by?
7. How does the work table move?
8. Where is the cutter mounted on?
9. What is known as slide and face cutter?
10. What types of milling machines do you know?
11. What are roller milling cutters used for?

Exercise 5. Find the wrong statements and correct them:

1. Milling is the process of drilling a hole.
2. A spindle carries multiple-toothed cutters, V-guides and slots.
3. The vertical milling machine consists of a casting and feed-gear box.
4. The knee is mounted on the horizontal V-guide.
5. A saddle moves at right angles on the top of the knee.
6. The height of the locking cut is permanently fixed.
7. The cutter used on the horizontal miller is a side and face cutter.

Exercise 6. Complete the statements choosing the appropriate variant:

1. The horizontal milling machine consists of a casting in which … is mounted and … .
   a) locking nut; hole;
   b) saddle; knee;
   c) the spindle; feed gear-box.
2. The cutter is mounted on … .
   a) arbor;
   b) surface;
   c) spindle.

3. The work table is mounted on … .
   a) V-guides;
   b) saddle;
   c) in two directions.
4. The vertical movement of the table is relative to … .
   a) saddle;
   b) cutter;
   c) cutting edges.
5. … have cutting edges in the form of helix about the axis of rotation.
   a) horizontal millers;
   b) face cutters;
   c) roller milling cutters.

Exercise 7. Translate into English:

1. Фрезерование – это процесс удаления металла с помощью вращающейся фрезы.
2. Фреза смонтирована на шпинделе.
3. Рабочий стол крепится на суппорте.
4. Зубчатая коробка передач и шпиндель – составные части горизонтального фрезерного станка.
5. Стол движется в двух направлениях.
6. Для плоских поверхностей используются роликовые фрезы.
7. Многозубчатые фрезы крепятся на шпинделе.

Exercise 8. Everyday English. On the phone. Complete the conversations with phrases from the box:

I'll give it to hold I'm phoning line's busy Speaking speak to leave a message we'll get back to you This is phone back later I'm afraid take a message have extension putting you through at her desk take your call

1. **A** Hello. Could I _____ Sam Jackson, please?
B _____ Mr Jackson's in a meeting. It won't be over until 3.00. Can I _____ ?
A Yes, please. Could you ask him to phone me? I think he's got my number, but _____ to you again just in case. It's 743 219186.

2. **A** Can I _____ 2173, please?
B The _____ at the moment. Would you like _____ ?
A Yes, please.
(Five seconds later.) **B**
I'm _____ now.
A Thank you.

3. **A** Could I speak to Alison Short?
B I'm afraid she isn't _____ at the moment. Do you want to hold?
A No, don't worry. I'll _____ .

4. **A** Can I speak to Terence Cameron, please?
B _____ .
A Ah, Mr Cameron! _____ Holly Lucas. _____ about a letter I got this morning.

5. **A** Hello. This is Incom International. There's no one here to _____ at the moment. Please _____ and _____ as soon as we can.

Milling (machining)

Exercise 1. Read the text. Pay attention to the underlined words.

Milling is the machining process of using rotary cutters to remove material from a workpiece by advancing (or *feeding*) the cutter into the workpiece at a certain direction. The cutter may also be held at an angle relative to the axis of the tool. Milling covers a wide variety of different operations and machines, on scales from small individual parts to large, heavy-duty gang milling operations. It is one of the most commonly used processes for machining custom parts to precise tolerances.

Milling can be done with a wide range of machine tools. The original class of machine tools for milling was the milling machine (often called a mill). After the advent of computer numerical control (CNC), milling machines evolved into machining centers: milling machines augmented by automatic tool changers, tool magazines or carousels, CNC capability, coolant systems, and enclosures. Milling centers are generally classified as vertical machining centers (VMCs) or horizontal machining centers (HMCs).

The integration of milling into turning environments, and vice versa, begun with live tooling for lathes and the occasional use of mills for turning operations. This led to a new class of machine tools, multitasking machines (MTMs), which are purpose-built to facilitate milling and turning within the same work envelope.

Cutters for a milling machine.

A **milling machine** is a power-driven machine used for the complex shaping of metal (or possibly other materials) parts. Its basic form is that of a rotating cutter or endmill which rotates about the spindle axis (similar to a drill), and a movable table to which the workpiece is affixed. That is to say the cutting tool generally remains stationary (except for its rotation) while the workpiece moves to accomplish the cutting action. Milling machines may be operated manually or under computer numerical control (CNC).

Milling machines can perform a vast number of complex operations, such as slot cutting, planing, drilling, rebating, routing, etc.

Cutting fluid is often pumped to the cutting site to cool and lubricate the cut, and to sluice away the resulting swarf.

Exercise 2. Answer the questions:
-What is milling?
-How may the cutter be held?
-What operations does milling cover?
-Can milling be done with a wide range of machine tools?

Drilling

Exercise 1. Translate the following:
a drill bit. to enlarge a hole, multipoint, torque , to be gripped, tip, offset, pillar, to restrain, advantage, invention, power sources, workbench, a rack, effort, to cut

Exercise 2. Find Russian equivalents.
a drill bit, to enlarge a hole, multipoint, torque , to be gripped, tip, offset, pillar, to restrain, advantage, invention, power sources, work bench, a rack, effort, to cut

---

Увеличить отверстие, многоточечный, вращающий момент, захватываться, наконечник, отклонённый, опора, ограничить, сверло, преимущество, изобретение, источники энергии, верстак, зубчатая рейка, усилие, резать

Exercise 3. Translate.

- to cut or enlarge a hole in solid materials
- by applying pressure and rotation to the work piece to create cylindrical holes
- to provide torque and axial force
- to be gripped by a chuck at one end of the drill
- to be pressed against the target material
- to be powered by various power sources over the centuries
- to be mounted on a stand or bolted to the floor to have a number of advantages
- to apply the drill to the work piece

Exercise 4. Find Russian equivalents in the text.

- многоточечный, концевой режущий инструмент
- образует стружки режущими краями
- образовывать отверстие
- отверстия нецилиндрической формы

- просверливать отверстия в различных материалах
- наконечник режущего инструмента
- можно регулировать
- просверливать точно

Exercise 5. Read the text.

DRILLING

Drilling is a cutting process that uses a drill bit to cut or enlarge a hole in solid materials. The drill bit is a multipoint, end cutting tool. It cuts by applying pressure and rotation to the work piece, which forms chips at the cutting edge. Drill bits are cutting tools used to create cylindrical holes. Bits are held in a tool called a drill, which rotates them and provides torque and axial force to create the hole. Specialized bits are also available for non-cylindrical-shaped holes.

A drill or drill motor is a tool fitted with a rotating cutting tool, usually a drill bit, used for drilling holes in various materials. The cutting tool is gripped by a chuck at one end of the drill and rotated while pressed against the target material. The tip of the cutting tool does the work of cutting into the target material.

Drills are commonly used in woodworking, metalworking, and construction and most "do it yourself' projects. Specially designed drills are also used in medicine, space missions and other applications.

The earliest drills were used by the ancient Egyptians. The drill press as a machine tool is many centuries old. It w[r]as powered by various power sources over the centuries, such as human effort, water wheels, and windmills, often with the use of belts. With the coming of the electric motor in the late 19th century, there was a great rush to power machine tools with such motors, and drills were among them. The invention of the first electric drill is credited to Arthur James Arnot and William Blanch Brain, in 1889, at Melbourne, Australia.

There are many types of drills: some powered manually, others using electricity or compressed air as the motive power.

A drill press is a fixed style of drill that may be mounted on a stand or bolted to the floor or workbench. A drill press consists of a base, column, table, spindle, and drill head, usually driven by an induction motor. The head has a set of handles (usually 3) radiating from a central hub that, when turned, move the spindle and chuck vertically, parallel to the axis of the column. The table can be adjusted vertically and is generally moved by a rack and pinion. The table may also be offset from the spindle's axis and in some cases rotated to a position perpendicular to the column.

A drill press has a number of advantages over a hand-held drill:

Less effort is required to apply the drill to the work piece. The movement of the chuck and spindle is by a lever working on a rack and pinion, which gives the operator considerable mechanical advantage.

The table allows a vise or clamp to be used to position and restrain the work, making the operation much more secure.

The angle of the spindle is fixed relative to the table, allowing holes to be drilled accurately.

Exercise 6. Answer the questions.

1. What is drilling used for?
2. What is a drill bit?
3. What operations is a drill used in?
4. When was the first electric drill invented?
5. What main parts does a drill press consist of?
6. What advantages does a drill press have over a hand-held drill?

Exercise 7. Use the right form of the verb.

1. A drill bit (to cut) or (to enlarge) a hole in solid materials.
2. Drill bits (to use) to create cylindrical holes.
3. A drill bit (to use) for drilling holes in various materials.
4. A drill press (to consist) of a base, column, table, spindle, and drill head.

Exercise 8. Translate into Russian.

1. Bits are held in a tool called a drill, which rotates them and provides torque and axial force to create the hole.
2. The cutting tool is gripped by a chuck at one end of the drill and rotated while pressed against the target material.
3. The earliest drills were used by the ancient Egyptians.
4. A drill press has a number of advantages over a hand-held drill.

Exercise 9. Translate the text.

Drilling

Drilling means cutting a hole with a tool called a drill. Drills are made of very hard steel because the cutting tool must be harder than the material to be cut. A drilling machine is a machine which holds and turns a drill to cut holes in metal. It also called a drill press or a driller. The hand driller is common drilling tool which is used for very light work. It is held with the left hand while the right hand turns the handle which causes the drill to turn. The left hand must press hard enough to make the drill cut. Many objects cannot be brought to the drilling machine so the drill is to be brought to them. A small drilling machine which can be carried from work to work and which is run by means of a separate electric motor is called electric driller.

The Vertical Spindle Drill Press is the most common drilling machine. It may have different sizes and various constructions. Small drill presses of this group are usually fed only by hand and can be used only for drilling small holes in light work. Large and powerful presses of this group kind have special gears for

changing speeds and also the drill may be fed into the work by means of automatic feed. Larger drills can be used in this machine than in the smaller ones.

Grinding

Grinding uses an abrasive process to remove material from the workpiece. A grinding machine is a machine tool used for producing very fine finishes, making very light cuts, or high precision forms using a abrasive wheel as the cutting device. This wheel can be made up of various sizes and types of stones, diamonds or inorganic materials.

The simplest grinder is a bench grinder or a hand-held angle grinder, for deburring parts or cutting metal with a zip-disc.

Grinders have increased in size and complexity with advances in time and technology. From the old days of a manual toolroom grinder sharpening endmills for a production shop, to today's 30000 RPM CNC auto-loading manufacturing cell producing jet turbines, grinding processes vary greatly.

Grinders need to be very rigid machines to produce the required finish. Some grinders are even used to produce glass scales for positioning CNC machine axis. The common rule is the machines used to produce scales be 10 times more accurate than the machines the parts are produced for.

In the past grinders were used for finishing operations only because of limitations of tooling. Modern grinding wheel materials and the use of industrial diamonds or other man-made coatings (cubic boron nitride) on wheel forms have allowed grinders to achieve excellent results in production environments instead of being relegated to the back of the shop.

Modern technology has advanced grinding operations to include CNC controls, high material removal rates with high precision, lending itself well to aerospace applications and high volume production runs of precision components.

UNIT 8

Методическое обеспечение:

1. Вопросы для самоконтроля.

Recourses Saving Technologies

Ecological Security of Technological Processes

TEXT A. CHANGES IN MATERIALS TECHNOLOGY

Since the technology of any age is founded upon the materials of the age, the era of new materials will have a profound effect on engineering of the future.

Not only new materials, but related, and equally important, new and improved and less wasteful processes for the shaping, treating and finishing of both traditional and new materials are continuously being developed.

It is important that an engineer should be familiar with them. These include casting, injection molding and rotational molding of components of ever increasing size, complexity and accuracy; manufacture of more complex components by powder metallurgy techniques; steel forming and casting processes based on new, larger and more mechanized machines, giving reduced waste and closer tolerances; the avoidance of waste in forging by the use of powder metallurgy or cast pressforms and new finishing processes for metals and plastics, just to name a few. A high proportion of these processes is aimed at the production of complex, accurate shapes with a much smaller number of operations and with far less waste than the traditional methods of metal manufacture.

Joining techniques have developed to unprecedented level of sophistication and are also providing opportunities for economies. It is necessary to mention that these newer techniques allow the manufacture of complicated parts by welding together simpler sub-units requiring little machining; such assemblies can be made from a variety of materials. The methods can also be used effectively for assembly, allowing savings to be made in both materials and machine utilization.

The brief review of new processes above has indicated that a new materials technology is rapidly emerging, providing new opportunities and challenges for imaginative product design and for more efficient manufacture.

Exercise 1.Translate the sentences, which of them are not correct.

1. Joining techniques have developed to the high level of sophistication. Joining techniques are developing to a high level of sophistication. 2. The review of new processes has indicated that a new materials technology is rapidly developing. The review of new processes is indicating that a new materials technology is rapidly developing. 3. The avoidance of waste in forging has been achievedby the use of

powder metallurgy. The avoidance of waste in forging is being achieved by the use of powder metallurgy.

Exercise 2.Translate the sentences:

1. They also undertake the training of people who want to work at the new plant but do not have the required qualification. 2. The students know how to conduct this experiment. 3. The students know how they have to conduct this experiment. 4. He shows me the results of his work. 5. He shows me what results he has obtained. 6. There is a growing need for engineers who are familiar with the fundamental problems in metal processing and manufacturing. 7. There is a growing need for engineers familiar with the fundamental problems in metal processing and manufacturing. 8. When new types of autos are designed all the latest achievements of scientific and engineering progress are taken into account. 9. When designing new types of autos all the latest achievements of scientific and engineering progress are taken into account.

On receiving his diploma the engineer does not finish his education.

When the engineer receives his diploma he does not finish his education.

Exercise 3. Answer the questions:

1. Is materials technology changing nowadays? 2. What do new manufacturing processes include? 3. What are they aimed at? 4. Can complicated parts be manufactured by welding together simpler sub-units? 5. Can these assemblies be made from a variety of materials? 6. What has the brief review of new materials and processes indicated? 7. Why is it necessary for an engineer to know these processes?

TEXT B. WORKING WITH NEW MATERIALS

A successful design is almost always a compromise among highest performance, attractive appearance, efficient production, and lowest cost. Achieving the best compromise requires satisfying the mechanical requirements of the part, utilizing the most economical material that will perform satisfactorily, and choosing a manufacturing process compatible with the part design and material choice. Stating realistic requirements for each of these areas is of the utmost importance.

The rapidity of change in materials technology is typified by the fact that plastics, a curiosity at the turn of the 20th century, are now being used in volumes which have for many years exceeded those of all the non-ferrous metals put together, and which are beginning to rival steel.

The changes which are taking place are, of course, not only quantitative. They are associated with radical changes in technology — in the range and nature of the materials and processes available to the engineer.

The highest specific strength (i.e. the strength available from unit weight of material) now available comes from non-metals, such as fibreglass, and from metals, such as berillium and titanium, and new ultrahigh strength steels.

Fibre technology, in its modern form, is of more recent origin than plastics, but composites based on glass and/or on carbon fibres are already being applied to pressure vessels, to lorry cabs and to aircraft engines, and may well replace aluminium for the skin and structure of aircraft. An all-plastic car has been exhibited: nearly the whole car, except the engine and transmission is of plastics or reinforced plastics.

It is not only plastics and their reinforcement which are changing the materials scene. Ceramics too are gaining an increasing foothold. Their impact as tooling materials in the form of carbides, nitrides and oxides is also well known — cutting tools made of these materials are allowing machining rates which had previously been considered quite impossible,

Silicon nitride seems to offer particular promise for a wide variety of applications. Among these is liquid metal handling. Pumps for conveying liquid aluminium are now on trial which could revolutionize the foundry industry. Silicon nitride is also being tested for the bearing surfaces of the Wankel rotary engines which are being developed as potential replacements for the conventional piston engines of our motor cars. And ceramic magnets have replaced the traditional steel pole-piece plus copper field coil for providing the engineering field for many electric motors.

It is clear that the number of combinations of all kinds of original trends in the production of new materials is practically unlimited. This, in turn, opens new realms for the designing of still cheaper, effective and unthinkably perfected, compared to that we have today, machines and mechanisms.

Exercise 4. Make up questions to the text B.

The Negative and Positive Ecological Impacts of Technology

In today's society more people are working longer hours and utilizing more technology in their everyday life. As a result of these longer hours and increased use of technology, more energy is being consumed. (Hayden and Shandra 575) The impact that this is having on the environment is substantial in both negative and positive ways. It is hard to deny the benefits modern technology has produced for the world, in industry and in everyday life. With more and more technological breakthroughs, there have been many positive ecological impacts. However, it is also hard to deny that there are considerable negative impacts as well.

The Negative Ecological Impacts of Technology

One of the biggest problems the world faces today is the amount of energy that is consumed globally. With almost all of the world's businesses using computer technology to operate, the energy consumption of the industrial world is constantly

on the increase. Countries such as the United States where the average employee works more than 40 hours a week, as a result, the energy consumption of a typical office in the United States is likely to be higher than that of an office in a country where the average work week does not exceed 40 hours. (Hayden and Shandra 576) Many offices run their computer systems on a mainframe server. This server is usually running 24 hours a day and is rarely shut down. To keep these servers from overheating, fans are installed within the hard drives. With the combined energy of the fans and the operation of the servers, the amount of energy being consumed is huge and results in a very high thermal count. (Courtney 48)

As it currently stands, many of the world's organizations have not begun to actively look for greener more ecologically sound methods for producing the energy they need. (Courtney 48) Today, many of these companies are not thinking of ways to improve their carbon footprint, yet it is an issue that needs to be addressed sooner rather than later.

But it is not just information communications technologies that have affected the ecology of the planet. A number of the ecological and environmental problems that are occurring are due to the rapid growth of new industrialized countries such as South Korea and China. (Jorgenson and Jorgenson 365) With so many countries now outsourcing their manufacturing to these industrialized nations, more and more factories are being constructed as a result. To run these factories, a large amount of energy consumption is needed as many of the factories operate 24 hours a day. The emissions these factories produce are amongst some of the highest in the world and contribute significantly to the amount noxious gases that pollute the air. (Hayden and Shandra 582)

Industry aside, there are many other ways technology has had a negative, ecological impact on the world. In the modern home, there are numerous high technology gadgets designed to make our lives easier and more pleasant. These gadgets range from the microwave to the electric kettle to refrigeration. One of the largest contributors to gases in the atmosphere are the gases produced by the combustion process used to produce energy. (Williams 36)

In the United States alone, 83% of this energy comes from a combustion process. (Williams 36) The combustion process is an effective way to produce energy for a wide range sources. The negative aspect of the combustion process however, is the amount of harmful gases that it produces. These gases can have a devastating impact on the ozone layer and contribute to what is known as the "Greenhouse Effect".

The Positive Ecological Impacts of Technology

Despite the claims that technology is to blame for many of the world's ecological problems, technology has also served to improve the shape of our planet. Since the rise of technology in the workplace, numerous ICT companies have been designing "greener technology" to combat the detrimental effect that computers and their accompanying technology have on the environment. One of the best known organizations is the Green Grid. (Courtney 49) The Green Grid is

an organization that consists of IT companies and professionals from around the world. (Courtney, p. 49) The Green Grid is devising ways to improve the way energy is consumed by IT oriented businesses and their offices. (Courtney 49) One of the biggest achievements of the Green Grid is the Power Usage Effectiveness or, PUE, metric system. This system records data center energy consumption. How it works is by recording the energy consumption of a data center or mainframe server every 15 minutes. By recording in these 15 minute increments it helps those monitoring the data to notice if there are any energy fluctuations and if the data center systems are using an adequate amount of energy. (Courtney 49) The long term goal of the Green Grid is to introduce a standard system that allows business managers and IT operatives to compare the amount of the energy they are consuming and if necessary resolve ways to reduce it. (Courtney 49)

Another technology that is having positive impacts on the environment is low carbon technology. (Xie 1593) Low carbon technology is a form of technology that has been developed in China. Largely developed because of China's low carbon footprint in comparison to other developing countries, the low carbon technology aims to offset the amount of emissions polluting the air by using renewable fossil fuels. (Xie 1594)

Other countries can also diversify into new low carbon options, thanks to the advances in technology. Bio-fuels, solar power and wind power are no longer science fiction but science fact. They are more than capable of replacing some of the energy resources currently used that produce harmful gases. (Xie 1596) These new developments towards a low carbon future are only possible through our advancements in modern technology and are one way that technology is having a positive and beneficial effect on the environment.

One obvious way that technology is helping the ecology of the planet is by reducing the need for paper. With the ever increasing use of email and electronic communication, paperless offices are now a common occurrence in companies.

Another example is the replacement of laser printers with multi-function devices. Multi-function devices usually incorporate a printer, fax machine and photocopier all in one system. This not only saves space but saves the amount of electronic hardware that is permanently on standby in an office. (

Conclusion

As a result of the increase in the various forms of technology, there are many positive and negative ecological impacts on the planet. Through the rise in modern technology and increase in globalization, there is a high increase in energy consumption. This in turn has devastating effects on the planet's climate and air quality. However, without modern technology there would not be the capability to improve energy management systems or to develop environmentally friendly products such as bio-fuels. To make a progressive step towards reducing the amount of damage technology does to the environment, it is necessary to find ways to manage new technology responsibly so that it can continue to have positive ecological impacts.

TEXTS FOR EXTRA-CURRICULUM READING

Text 1. Famous people of science. Dmitry Ivanovich Mendeleyev

Dmitry Ivanovich Mendeleyev is a famous Russian chemist. He is the best known for his development of the periodic table of the properties of the chemical elements. This table displays that elements' properties are changed periodically when they are arranged according to atomic weight.

Mendeleyev was born in 1834 in Tobolsk, Siberia. He studied chemistry at the University of St. Petersburg, and in 1859 he was sent to study at the University of Heidelberg. Mendeleyev returned to St. Petersburg and became Professor of Chemistry at the Technical Institute in 1863. He became Professor of General Chemistry at the University of St. Petersburg in 1866. Mendeleyev was a well-known teacher, and, because there was no good textbook in chemistry at hat time, he wrote the two-volume "Principles of Chemistry" which became a classic textbook in chemistry.

In this book Mendeleyev tried to classify the elements according to their chemical properties. In 1869 he published his first version of his periodic table of elements. In 1871 he published an improved version of the periodic table, in which he left gaps for elements that were not known at that time. His table and theories were proved later when three predicted elements: gallium, germanium, and scandium were discovered.

Mendeleyev investigated the chemical theory of solution. He found that the best proportion of alcohol and water in vodka is 40 %. He also investigated the thermal expansion of liquids and the nature of petroleum.

In 1893 he became director of the Bureau of Weights and Measures in St. Petesrburg and held this position until his death in 1907.

Text 2. Famous people of science. Mikhail Vasilyevich Lomonosov

Mikhail Vasilyevich Lomonosov was a famous Russian writer, chemist, and astronomer who made a lot in literature and science.

Lomonosov was born on November 19, 1711, in Denisovka (now Lomonosov), near Archangelsk, and studied at the University of the Imperial Academy of Sciences in St. Petersburg. After studying in Germany at the Universities of Marburg and Freiberg, Lomonosov returned to St. Petersburg in 1745 to teach chemistry and built a teaching and research laboratory there four years later.

Lomonosov is often called the founder of Russian science. He was an innovator in many fields. As a scientist he rejected the phlogiston theory of matter commonly accepted at the time and he anticipated the kinetic theory of gases. He regarded heat as a form of motion, suggested the wave theory of light, and stated

the idea of conservation of matter. Lomonosov was the first person to record the freezing of mercury and to observe the atmosphere of Venus during a solar transit.

Interested in the development of Russian education, Lomonosov helped to found Moscow State University in 1755, and in the same year wrote a grammar that reformed the Russian literary language by combining Old Church Slavonic with modern language. In 1760 he published the first history of Russia. He also revived the art of Russian mosaic and built a mosaic and coloured-glass factory. Most of his achievements, however, were unknown outside Russia. He died in St. Petersburg on April 15, 1765.

Text 3. Famous people of science and engineering. Igor Ivanovich Sikorsky

Sikorsky Igor Ivanovich was a well-known aircraft engineer and manufacturer.

Sikorsky was born in 1889 in Kiev, in the Ukraine, and got his education at the naval college in St. Petersburg, and later in Kiev and Paris. He was the first to make experiments in helicopter design. In 1913 he designed, built, and flew the first successful aeroplane. Later he built military aircrafts for Russia and France.

In 1919 Sikorsky moved to the United States and later helped to organize an aircraft company that produced a series of multiengine flying boats for commercial service. Sikorsky became an American citizen in 1928. In the late 1930s he returned to developing helicopters and produced the first successful helicopter in the west. Helicopters designed be Sikorsky were used mostly by the US Army Air Forces during World War II. He died in 1972 at the age of 83.

Text 4. Famous people of science and engineering. George Stephenson

George Stephenson was a British inventor and engineer. He is famous for building the first practical railway locomotive.

Stephenson was born in 1781 in Wylam, near Newcastle upon Tyne, Northumberland. During his youth he worked as a fireman and later as an engineer in the coal mines of Newcastle. He invented one of the first miner’s safety lamps independently of the British inventor Humphry Davy. Stephenson’s early locomotives were used to carry loads in coal mines, and in 1832 he established a factory at Newcastle for their manufacture. In 1829 he designed a locomotive known as the Rocket, which could carry both loads and passengers at a greater speed than any locomotive constructed at that time. The success of the Rocket was the beginning of the construction of locomotives and the laying of railway lines.

Robert Stephenson, the son of George Stephenson was a British civil engineer. He is mostly well-known for the construction of several notable bridges.

He was born in 1803 in Willington Quay, near Newcastle upon Tyne, and educated in Newcastle and at the University of Edinburg. In 1829 he assisted his father in constructing a locomotive known as the Rocket, and four years later he

was appointed as a construction engineer of the Birmingham and London Railway, completed in 1838. Stephenson built several famous bridges, including the Victoria Bridge in Northumberland, the Britannia Bridge in Wales, two bridges across the Nile in Damietta in Egypt and the Victoria Bridge in Montreal, Canada. Stephenson was a Member of Parliament from 1847 until his death in 1859.

Text 5. Famous inventors. Alfred Bernhard Nobel

Alfred Bernhard Nobel was a famous Swedish chemist and inventor. He was born in Stockholm in 1833. After receiving an education in St. Petersburg, Russia, and then in the United States, where he studied mechanical engineering, he returned to St. Petersburg to work with his father in Russia. They were developing mines, torpedoes, and other explosives.

In a family-owned factory in Heleneborg, Sweden, he developed a safe way to handle nitroglycerine, after a factory explosion in 1864 killed his younger brother and four other people. In 1864 Nobel achieved his goal: he produced what he called dynamite. He later produced one of the first smokeless powders. At the time of his death he controlled factories for the manufacture of explosives. in many parts of the world. In his will he wanted that the major portion of his money left became a fund for yearly prizes in his name. The prizes were to be given for merits in physics, chemistry and physiology, literature, and world peace. A prize in economics has been awarded since 1969.

Text 6. Famous people of science and technology. James Prescott Joule

James Prescott Joule, famous British physicist, was born in 1818 in Salford, England.

Joule was one of the most outstanding physicists of his time. He is best known for his research in electricity and thermodynamics. In the course of his investigations of the heat emitted in an electrical circuit, he formulated the law, now known as Joule’s law of electric heating. This law states that the amount of heat produced each second in a conductor by electric current is proportional to the resistance of the conductor and to the square of the current. Joule experimentally verified the law of conservation of energy in his study of the conversion of mechanical energy into heat energy.

Joule determined the numerical relation between heat and mechanical energy, or the mechanical equivalent of heat, using many independent methods. The unit of energy, called the joule, is named after him. It is equal to 1 wattsecond. Together with the physicist William Thomson (Baron Kelvin), Joule found that the temperature of a gas falls when it expands without doing any work. This phenomenon, which became known as the Joule-Thomson effect, lies in the operation of modern refrigeration and air-conditioning systems.

Text 7. Famous people of science and engineering. James Watt

James Watt was a Scottish inventor and mechanical engineer, known for his improvements of the steam engine.

Watt was born on January 19, 1736, in Greenock, Scotland. He worked as a mathematical-instrument maker from the age of 19 and soon become interested in improving the steam engine which was used at that time to pump out water from mines.

Watt determined the properties of steam, especially the relation of its density to its temperature and pressure, and designed a separate condensing clamber for the steam engine that prevented large losses of steam in the cylinder. Watt's first patent, in 1769, covered this device and other improvements on steam engine.

At that time, Watt was the partner of the inventor John Roebuck, who had financed his researches. In 1775, however, Roebuck's interest was taken over by the manufacturer Matthew Boulton, owner of the Soho Engineering Works at Birmingham, and he and Watt began the manufacture of steam engines. Watt continued his research and patented several other important inventions, including the rotary engine for driving various types of machinery; the double-action engine, in which steam is admitted alternately into both ends of the cylinder; and the steam indicator, which records the steam pressure in the engine. He retired from the firm in 1800 and thereafter devoted himself entirely to research work.

The misconception that Watt was the actual inventor of the steam engine arose from the fundamental nature of his contributions to its development. The centrifugal or flyball governor, which he invented in 1788, and which automatically regulated the speed of an engine, is of particular interest today. It embodies the feedback principle of a servomechanism, linking output to input, which is the basic concept of automation. The watt, the unit of power, was named in his honour. Watt was also a well-known civil engineer. He invented, in 1767, an attachment that adapted telescopes for use in the measurement of distances. Watt died in Heathfield, near Birmingham, in August 1819.

Text 8. Famous people of science and engineering. Charles Babbage

Charles Babbage (1792-1871), British mathematician and inventor, who designed and built mechanical computing machines on principles that anticipated the modern electronic computer. Babbage was born in Teignmouth, Devon< and educated at the University of Cambridge. He became a Fellow of the Royal Society in 1816 and was active in founding of the Analytical, the Royal Astronomical, and the Statistical Societies.

In the 1820s Babbage began developing his Difference Engine, a mechanical device that could perform simple mathematical calculations. Although Babbage started to build his machine, he was unable to complete it because of lack of

funding. In the 1830s Babbage began developing his Analytical Engine, which was designed to carry out more complicated calculations, but this device was never built, too. Babbage's book, "Economy of Machines and Manufactures" (1832), initiated the field of study known today as operational research.

Text 9. Famous inventors. Andrei Dmitrievich Sakharov

Andrei Dmitrievich Sakharov was a Russian nuclear physicist, anti-Soviet dissident and human rights activist.

He became renowned as the designer of the Soviet Union's Third Idea, a codename for Soviet development of thermonuclear weapons. Sakharov was an advocate of civil liberties and civil reforms in the Soviet Union. He was awarded the Nobel Peace Prize in 1975. The Sakharov Prize, which is awarded annually by the European Parliament for people and organizations dedicated to human rights and freedoms, is named in his honor.

Sakharov was born in Moscow on May 21, 1921.

Sakharov entered Moscow State University in 1938. Following evacuation in 1941 during the Great Patriotic War (World War II), he graduated in Aşgabat, in today's Turkmenistan. He was then assigned laboratory work in Ulyanovsk. He returned to Moscow in 1945 to study at the Theoretical Department of FIAN (the Physical Institute of the Soviet Academy of Sciences). He received his Ph.D. in 1947.

After the end of World War II, he researched cosmic rays. In mid-1948 he participated in the Soviet atomic bomb project under Igor Kurchatov and Igor Tamm. The first Soviet atomic device was tested on August 29, 1949. After moving to Sarov in 1950, Sakharov played a key role in the development of the first megaton-range Soviet hydrogen bomb using a design known as *Sakharov's Third Idea* in Russia and the Teller-Ulam design in the United States. A larger variation of the same design which Sakharov worked on was the 50 Mt Tsar Bomba of October 1961, which was the most powerful nuclear device ever exploded.

Sakharov later wrote: "After more than forty years, we have had no third world war, and the balance of nuclear terror ... may have helped to prevent one. But I am not at all sure of this; back then, in those long-gone years, the question didn't even arise. What most troubles me now is the instability of the balance, the extreme peril of the current situation, the appalling waste of the arms race ... Each of us has a responsibility to think about this in global terms, with tolerance, trust, and candor, free from ideological dogmatism, parochial interests, or national egotism."

Text 10. Famous people of science and engineering. Bill Gates

William Henry Gates (born October 28, 1955) is an American business magnate, philanthropist, investor, computer programmer, and inventor. Gates is the

former chief executive and chairman of Microsoft, the world’s largest personal-computer software company, which he co-founded with Paul Allen.

He is consistently ranked in the Forbes list of the world's wealthiest people and was the wealthiest overall from 1995 to 2009 — excluding 2008, when he was ranked third; in 2011 he was the wealthiest American and the world's second wealthiest person. According to the Bloomberg Billionaires List, Gates is the world's richest person in 2013, a position that he last held on the list in 2007.

During his career at Microsoft, Gates held the positions of CEO and chief software architect, and remains the largest individual shareholder, with 6.4 percent of the common stock. He has also authored and co-authored several books.

Gates is one of the best-known entrepreneurs of the personal computer revolution. Gates has been criticized for his business tactics, which have been considered anti-competitive, an opinion which has in some cases been upheld by judicial courts. In the later stages of his career, Gates has pursued a number of philanthropic endeavors, donating large amounts of money to various charitable organizations and scientific research programs through the Bill & Melinda Gates Foundation, established in 2000.

Gates stepped down as chief executive officer of Microsoft in January 2000. He remained as chairman and created the position of chief software architect for himself. In June 2006, Gates announced that he would be transitioning from full-time work at Microsoft to part-time work, and full-time work at the Bill & Melinda Gates Foundation. He gradually transferred his duties to Ray Ozzie, chief software architect, and Craig Mundie, chief research and strategy officer. Gates's last full-time day at Microsoft was June 27, 2008. He stepped down as chairman of Microsoft in February 2014, taking on a new post as technology advisor to support newly appointed CEO Satya Nadella.

Text 11. Metal casting – a basic manufacturing process

One of the basic processes of the metalworking industry is the production of metal castings. A casting may be defined as "a metal object obtained by allowing molten metal to solidify in a mold", the shape of the object being determined by the shape of the mold cavity. A foundry is a commercial establishment for producing castings.

Numerous methods have been developed through the ages for producing metal castings but the oldest method is that of making sand castings in the foundry. Primarily, work consists of melting metal in a furnace and pouring it into suitable sand molds where it solidifies and assumes the shape of the mold.

Most castings serve as details or component parts of complex machines and products. In most cases they are used only when they are machined and finished to specified manufacturing tolerances providing easy and proper assembly of the product.

At present the foundry industry is going through a process of rapid transformation, owing to modern development of new technological methods, new machines and new materials. Because of the fact that casting methods have advanced rapidly owing to the general mechanical progress of recent years there is today no comparison between the quality of castings, the complexity of the patterns produced and the speed of manufacture with the work of a few years ago.

Text 12. Drilling

Drilling is a cutting process that uses a drill bit to cut or enlarge a hole in solid materials. The drill bit is a multipoint, end cutting tool. It cuts by applying pressure and rotation to the work piece, which forms chips at the cutting edge. Drill bits are cutting tools used to create cylindrical holes. Bits are held in a tool called a drill, which rotates them and provides torque and axial force to create the hole. Specialized bits are also available for non-cylindrical-shaped holes.

A drill or drill motor is a tool fitted with a rotating cutting tool, usually a drill bit, used for drilling holes in various materials. The cutting tool is gripped by a chuck at one end of the drill and rotated while pressed against the target material. The tip of the cutting tool does the work of cutting into the target material.

Drills are commonly used in woodworking, metalworking, and construction and most "do it yourself' projects. Specially designed drills are also used in medicine, space missions and other applications.

The earliest drills were used by the ancient Egyptians. The drill press as a machine tool is many centuries old. It w[r]as powered by various power sources over the centuries, such as human effort, water wheels, and windmills, often with the use of belts. With the coming of the electric motor in the late 19th century, there was a great rush to power machine tools with such motors, and drills were among them. The invention of the first electric drill is credited to Arthur James Arnot and William Blanch Brain, in 1889, at Melbourne, Australia.

There are many types of drills: some powered manually, others using electricity or compressed air as the motive power.

A drill press is a fixed style of drill that may be mounted on a stand or bolted to the floor or workbench. A drill press consists of a base, column, table, spindle, and drill head, usually driven by an induction motor. The head has a set of handles (usually 3) radiating from a central hub that, when turned, move the spindle and chuck vertically, parallel to the axis of the column. The table can be adjusted vertically and is generally moved by a rack and pinion. The table may also be offset from the spindle's axis and in some cases rotated to a position perpendicular to the column.

A drill press has a number of advantages over a hand-held drill:

Less effort is required to apply the drill to the work piece. The movement of the chuck and spindle is by a lever working on a rack and pinion, which gives the operator considerable mechanical advantage.

The table allows a vise or clamp to be used to position and restrain the work, making the operation much more secure.

The angle of the spindle is fixed relative to the table, allowing holes to be drilled accurately.

Text 13. The hydrolic grinder

1.This universal grinder is designed for grinding cylindrical holes and faces of work pieces. It is widely used for lot production in various types of machine building plants.

2.Machines of this type are of very massive construction, but they are designed in such a way that they can be operated as easily as machines of smaller sizes.

3.They are hydraulically operated and controlled by a single lever located at the front end of the machine. This single lever controls all functions of the machine including all movements of the wheel slide, cross-feed, starting and stopping the work of the spindle.

4.The wheel spindle is driven by a V-belt from a motor located on a bracket on the wheel slide. The cross-feed for the wheel slide is operated by a hydraulic unit.

5. The wheel head is clamped on the top surface of the table. When setting up the grinder, the wheel head can be adjusted in a longitudinal direction to suit the length of the work piece.

Text 14. Machine elements

A machine is any device that uses energy to perform some activity. In common usage, the meaning is that of a device having parts that perform or assist in performing any type of work. A simple machine is a device that transforms the direction or magnitude of a force without consuming any energy. The word "machine" is derived from the Latin word “machine”, which means, expedient, remedy". It may be anything from such an elementary machine as a wedge or a lever to a steam turbine. In practice such simple machines as levers, wedges or pulleys are not spoken of as machines. This name is used for instruments consisting of many elements.

There is, of course, an enormous number of different machines, such as printing machines, machine tools, sewing machines, combustion engines, refrigerators, etc. Although each of this consists of different parts and elements, there are some machine elements that are common to most machines.

Every machine has a frame on which the other parts are mounted and the method of joining these parts to each other is more or less the same in all machines. Two pieces of metal can be joined into one piece by welding them together, which is done by either gas welding or electric welding. A bolted joint is achieved by means of nuts and bolts. A bolt consists of the head and the shank with the thread.

Many parts of a machine are mobile. A shaft, for instance, rotates about its axis, and in order to make this motion possible, it is mounted in bearings. Ball bearings and rolled bearings are, of course, preferable, since they reduce friction and require less lubrication. If we want to connect two shafts together, we couple them. Some well known couplings are flange coupling and the sleeve or muff. If the two shafts are not permanently coupled to each other, but can be made to engage and disengage, the coupling is called a clutch. Jaw clutches are widely used, but friction clutches are also used where the shafts require to be connected while running. Wheels are mounted on shafts by means of keys.

Text 15. Machine-tools

Before metal is formed into the required shape, it has to undergo a number of processes, such as casting, rolling, forging, welding, piercing, trimming, spinning, bending, drawing, etc. The machines which work on the surface of the metal piece, or provide it with grooves or holes or with a thread are called machine-tools.

The term machine tool is usually reserved for tools that used a power source other than human movement. The first machine tools offered for sale were constructed by Matthew Murray in England around 1800.

The most common machine-tool found in almost any workshop is the lathe, in which the job spins round its axis while a cutting tool is working on it. Its main parts are: the headstock, the chuck, the tailstock, the lathe bed, the carriage. The headstock usually contains the gearing mechanism. The job is clamped into the chuck. The tailstock can be moved along the bed to adjust the distance between the chuck and the tailstock centre. The carriage consists of the saddle and the cross slide on which the tool holder with the tool is mounted.

The speed at which the lathe turns can be adjusted either by regulating the speed of the motor driving it, or by the gearing. The automatic turret lathe is a perfection of the ordinary lathe. Its tools are changed automatically. A worker skilled in the use of a lathe is called a turner.

Other machine-tools work on plane surfaces for example milling machines, and also planning and shaping machines. A broaching machine employs broaches to make non-circular holes. Circular holes are drilled by a drilling machine or bored by a boring machine or a boring mill. Gear cutting machines include gear milling machines, gear shapers and gear grinding machines. Thread milling machines are used in the production of threads on shafts and on other machine elements.

All these machines use cutting tools, usually made of high-speed steel; grinding machines, on the other hand use abrasives such as diamonds, diamond dust, corundum, silicon carbide, etc. Honing and lapping machines also use abrasives; they enable us to obtain a smooth finish of less than 001 mm.

Text 16. Lathe

A lathe is a machine tool which spins a block of material to perform various operations such as cutting, sanding, drilling, or deformation with tools that are applied to the work piece to create an object which has symmetry about an axis of rotation.

Lathes are used in woodturning, metalworking, metal spinning, and glass working. Lathes can be used to shape pottery, the best-known design being the potter's wheel. Most suitably equipped metalworking lathes can also be used to produce plane surfaces and screw threads.

The lathe is an ancient tool; it was first developed by the Egyptians around 1300 BC. During the industrial revolution the lathe was motorized, allowing wooden turned items to be created in less time and allowing the working of metal on a lathe. The motor produced a greater rotational speed, makes it easier to quickly produce high quality work. Today most lathes are computer operated allowing for mass-production that can be created with accurate precision and without the cost of employing craftsmen.

The largest part of the lathe is called the bed on which the headstock and the tailstock are fastened at opposite ends. On the upper part of the bed there are special ways upon which the carriage and tailstock slide.

The two lathe centers are mounted in two spindles: one (the live center) is held in the headstock spindle while the other (the dead center) - in the tail- stock spindle.

The lathe chuck is used for chucking the work that is for clamping it so that it will rotate without wobbling while turning. The chucks usually mounted on the headstock spindle, may have different size and constructions.

If the work is perfectly round, it may be chucked in the so-called three-jaw universal chuck all the jaws of which are moved to the center by turning the screw. But if the work is not perfectly round, the four-jaw independent chuck should be used.

In turning different materials and works of different diameter, lathes must be run at different speeds. The gear box contained in the headstock makes it possible to run the lathe at various speeds.

Before turning a work in the lathe, the lathe centers are to be aligned, that means that the axes of both centers must be on one line.

The alignment of the lathe centers may be tested by taking a cut and then measuring both ends of the cut with a micrometer.

Not all works should be fastened between the two centers of the lathe. A short work may be turned without using the dead center, by simply chucking it properly at the spindle of the head- stock.

Text 17. Drilling machines

Drilling machines are very old machine tools mainly employed for drilling holes of different sizes in metal or any other solid material. In addition to drilling holes, such operations as *tapping, reaming, lapping, countersinking* and *counted boring* may be performed on the drilling machines. Since drilling machines are used for a great variety of operations they fall into various classes, the main of them being *upright* or *vertical spindle, multiple-spindle,* and *radial spindle chines.* In all three types, the drill spindle rotates in a sleeve *at quill* which does not rotate but is free to move axially to provide the necessary feed for the drill.

In vertical spindle drilling machines the spindle is in a vertical position. The *upright drilling machine* (Fig. 51) has an upright column resting on a heavy base. The column equipped with a gearbox providing a wide range of speed has a feed mechanism. The feed mechanism represents a feed shaft with its necessary gearing by which the drill is cut into the work at a proper speed. The feed shaft and the gearing provide a mechanical feed and any adjustment of both the drilling head mounted on the top of the column and the table for drilling operations.

Since in the upright drilling machines the spindle sleeve supports are fixed, all adjustment for different classes of work is made by moving the table which is accomplished by turning the *crank.* The table can be moved in a horizontal plane, clamped at any point or, if desired, swung out of the way so that large work may be placed on the base. The machine is also equipped with a *ratchet lever* for hand feeding the drill. A handwheel is fastened to a worm shaft whoseworm engages a worm gear on the pinion feed shaft, giving a motion much finer than that obtained by using the hand lever. Speed changes in the upright drilling machines are effected either by cone pulleys or by a geared head.

The upright drilling machines, in turn, are classified as: *heavy duty, plain,* and *sensitive.* The heavy duty drilling machine is used for heavy drilling the plain vertical spindle machine being employed for lighter work. The sensitive drilling machine is a vertical or upright machine of comparatively light construction adapted to very high speeds of drilling holes in delicate works.[1] The *multiple-spindle drilling* machines are built in both vertical and horizontal types.

Saving considerable time and space this machine is used for simultaneous drilling of many holes in a large number of workpieces. The machine may have a number of movable drills mounted on the cross way, all the spindles being driven from the same shaft by a worm gear. One of the types of the multiple-spindle machines is the fully automatic multiple-spindle drill head machine requiring

only *push-button* operation once it has been set up. The machine is provided with a large number of spindles ranging from four to a hundred or even more, which are driven by the same spindle drive gear in the same head.

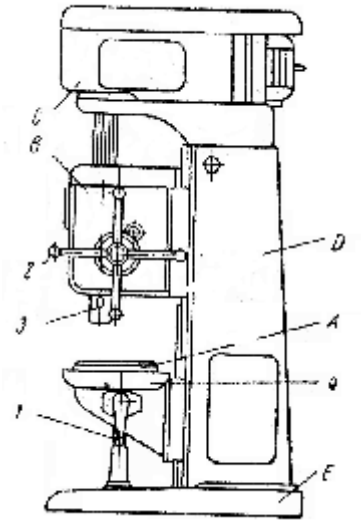


*Fig. 1.*Upright Drilling Machine:

1 — table traverse lever; *2* — feed change lever; *3* — spindle; *4* — swarf tray; *A* — table; *B* — feed change gearbox; *C* — gearbox; *D* — column; *E* — base

The *radial drilling machine* has a vertical column mounted on a cast iron base. The column carries a *radial arm* which moves not only in a horizontal plane with the column, but may also be moved in a vertical plane. A drilling head carrying the drill and power feed mechanism may be moved along horizontal ways of the arm. Bored to take a Morse taper shank, the spindle is driven by a reversing motor, flange mounted on top of the gearbox.[2] The drill can be moved over the work to any desired position so that many holes may be drilled in the work without moving it from one place to another. The radial drilling machine is therefore adapted to heavy work where it is easier to move the drill than the work.

Spindle speed and feed changes are effected by gearing. Drilling speeds may vary from 40 ft. per min[3]' for cast and alloy steels to 300 ft per min for brass bronze, drillings feeds ranging from 002" per revolution for $\frac{1"}{8}$ diameter drills to 15" per revolution for drills 1" in diameter and over.

Text 18. Milling machines

Milling is the process of machining flat, curved, or irregular surfaces by feeding the work piece against a rotating cutter containing a number of cutting edges. The usual Mill consists basically of a motor driven spindle, which mounts

and revolves the milling cutter, and a reciprocating adjustable worktable, which mounts and feeds the work piece.

Milling machines are basically classified as vertical or horizontal. These machines are also classified as knee-type, ram-type, manufacturing or bed type, and planer-type. Most milling machines have self-contained electric drive motors, coolant systems, variable spindle speeds, and power-operated table feeds.

TYPES OF MILLING MACHINES KNEE-TYPE

Knee-type mills are characterized by a vertically adjustable worktable resting on a saddle which is supported by a knee. The knee is a massive casting that rides vertically on the milling machine column and can be clamped rigidly to the column in a position where the milling head and milling machine spindle are properly adjusted vertically for operation.

The plain vertical machines are characterized by a spindle located vertically, parallel to the column face, and mounted in a sliding head that can be fed up and down by hand or power. Modern vertical milling machines are designed so the entire head can also swivel to permit working on angular surfaces.

The turret and swivel head assembly is designed for making precision cuts and can be swung 360° on its base. Angular cuts to the horizontal plane may be made with precision by setting the head at any required angle within a 180° arc.

The plain horizontal milling machine's column contains the drive motor and gearing and a fixed position horizontal milling machine spindle. An adjustable overhead arm containing one or more arbor supports projects forward from the top of the column. The arm and arbor supports are used to stabilize long arbors. Supports can be moved along the overhead arm to support the arbor where support is desired depending on the position of the milling cutter or cutters.

The milling machine's knee rides up or down the column on a rigid track. The milling machine is excellent for forming flat surfaces, forming and fluting milling cutters and reamers, cutting gears. Many special operations can be performed with the attachments available for milling machine use. The knee is used for raising and lowering. The saddle rests upon the knee and supports the worktable. The saddle controls cross feed of the worktable. The worktable traverses to the right or left upon the saddle for feeding the work piece past the milling cutter. The table may be manually controlled or power fed.

Text 19. The hydraulic internal grinder

Machines of this type are of extremely massive construction but are so designed that they can be operated as easily as machines of smaller sizes. They are hydraulically operated, and controlled by a single lever conveniently located at the front of the machine. This single lever controls all functions of the machine, including all movements of the wheel slide, cross feed, and starting and stopping

the work-spindle. The wheel slide can be swung to the rear through the medium of the hydraulic lifter, thus giving, easy and rapid access to the work. The wheel-spindle is driven by V-belts from a motor on an adjustable bracket on the wheel slide. Idlers are provided to give a maximum of belt contact and to maintain proper belt tension. The cross feed for the wheel slide is also operated by a hydraulic unit and can be set automatically.

ЗАДАНИЯ ДЛЯ САМОКОНТРОЛЯ

INTRODUCTORY COURSE

Degrees of comparison of adjectives

Variant 1

1.Образуйте сравнительную и превосходную степени прилагательных.

short fresh

hot easy

gay skillful

2.Образуйте подходящую по смыслу степень прилагательного.

1. My flat is (large) than my friend's flat. 2. My son had (many) lessons today than yesterday. 3. My friend's car is not so (new) as my car. 4. It was (good) meal I've ever had. 5. The Moscow Metro is (beautiful) in the world.

3.Переведите.

1.Самая дождливая погода бывает осенью. 2.Погода завтра будет хуже, чем сегодня. 3.Ваши руки такие же холодные, как и его. 4.Витебск дальше от Минска, чем Орша. 5.Чем ближе зима, тем короче дни.

Variant 2

1.Образуйте сравнительную и превосходную степени прилагательных.

good happy

big busy

high beautiful

2.Образуйте подходящую по смыслу степень прилагательного.

1. The Caucasus are (high) mountains in Europe. 2. Mary is (old) than Kate. 3. It is (cold) today than it was yesterday 4. It was (bad) cold I've ever had. 5. Minsk is (large) city in our country.

3.Переведите.

1.Самые жаркие дни бывают летом. 2. Эта книга не такая интересная, как та. 3.Какой месяц самый холодный? 4. Чем больше я читаю, тем больше я знаю. 5. Осень теплее, чем зима.

Variant 3

1.Образуйте сравнительную и превосходную степени прилагательных.

much small

fat clever

lazy famous

2.Образуйте подходящую по смыслу степень прилагательного.

1. The sea is not so (large) as the ocean.2. The Russian grammar is (difficult) than the English one. 3. My friend is (good) doctor here. 4. The 22nd of December is (short) day in the year. 5. Kate is (young) than Mary.

3.Переведите.

1.Март не такой холодный как февраль. 2. Это самый старый театр в Лондоне. 3. Чем меньше мы говорим по английски, тем хуже для нас. 4. Её машина меньше, чем его. 5. Сегодня также холодно, как и вчера.

Variant 4

1.Образуйте сравнительную и превосходную степени прилагательных.

little few

many nice

wet charming

2.Образуйте подходящую по смыслу степень прилагательного.

1. The (much) we read the (much) we know.2. It is (interesting) film I have ever seen. 3. She can speak English (fast) than other students. 4. The London underground is (old) in Europe. 5. My friend was (good) pupil in the class.

3.Переведите.

1. Река Волга больше, чем река Свислочь. 2. Это платье самое дорогое в магазине. 3.Эта зима такая же холодная, как и прошлая. 4. Их дом более новый, чем наш. 5. Это самая красивая достопримечательность, которую я когда-либо видела.

Keys. (Ответы)

Variant 1 1. short-shorter-the shortest hot-hotter-the hottest gay-gayer-the gayest fresh-fresher-the freshest easy-easier-the easiest skillful-more skillful-the most skillful	2. 1. larger 2.more 3.new 4. the best 5. the most beautiful 3. 1. The rainiest weather is in autumn. 2 The weather tomorrow will be worse than today.3. Your hands are as cold as his. 4. Vitebsk is farther from Minsk than Orsha. 5. The closer the winter, the shorter the days.
Variant 2 1. good –better-the best big-bigger-the biggest high-higher-the highest happy-happier-the happiest busy-busier-the busiest beautiful - more beautiful - the most beautiful	2. 1. the highest 2.elder 3.colder 4.the worst 5. the largest 3. 1 The hottest days are in the summer. 2 This book is not as interesting as that one.3 What is the coldest month? 4 The more I read, the more I know. 5 Autumn is warmer than winter.
Variant 3 1. much-more-the most fat-fatter-the fattest lazy-lasier-the lasiest small-smaller-the smallest clever-cleverer-the cleverest famous-more famous-the most famous	2. 1. large 2.more difficult 3.the best 4.the shortest 5.younger 3. 1 March is not so cold as February. 2 This is the oldest theater in London. 3 The less we speak English, the worse for us. 4 Her car is smaller than his. 5 Today is as cold as yesterday.
Variant 4 1. little-less-the least many-more-the most wet-wetter-the wettest few-fewer-the fewest nice-nicer-the nicer charming-more charming-the most charming	2. 1.more, more 2.the most interesting 3. faster 4.the oldest 5.the best 3. The Volga River is bigger than the Svisloch River. 2 This dress is the most expensive in the store. 3 This winter is as cold as the past. 4 Their home is newer than ours.5 This is the most beautiful landmark I've ever seen.

MAIN COURSE

Manufacturing and Technological Processes

Steel. Metalworking

Variant 1

1. Find Russian equivalents.

1. property	a) отпуск
2. tube	b) свойство
3. drawing	c) плунжер
4. ram	d) токарный станок
5. lathe	e) труба

2 Match English word combinations.

1. stainless	a) die
2. amount of	b) ram
3. high	c) steel
4. driving	d) temperature
5. forging	e) carbon

3 Make up sentences

1. toughness, gives, strength, and, manganese, extra
2. resistance, the, chromium, extra, addition, of, and, strength, gives, corrosion
3. sheet, is, the, rolled, most, product, common
4. cans, the, manufacturing, example, of, is, the, cans, aluminium, extrusion, of, beer

4 Translate into English.

1. Сталь – это сплав железа и углерода.
2. Стали с низким содержанием углерода довольно гибкие и используются в производстве листового железа, проволоки и труб.
3. Добавление хрома придаёт стали сверх прочность и устойчивость к коррозии.
4. Поверхность холоднокатаного листа более гладкая и он прочнее.

Variant 2

1 Find Russian equivalents.

1. hammer	a) полезный
2. force	b) штамп
3. billet	c) сила
4. useful	d) ковать
5. die	e) заготовка

2 Match English word combinations.

1. resist	a) extrusion
2. cutting	b) corrosion
3. exhaust	c) rolling
4. impact	d) tools
5. cold	e) tube

3 Make up sentences.

1. steel, the, other, inclusion, of, elements, of, properties, affects, the, the
2. carbon, and, is, of, steel, allow, an, iron
3. stronger, cold, metal, the, to, hardens, working, part, make
4. die, is, billet, of, extrusion, flow, a, to, pushing, through, the, orifice, the

4 Translate into English.

1. Во время прокатки, штамповки, протягивания, ковки и листовой штамповки металл подвергается большим деформациям.
2. Количество углерода в стали значительно влияет на её свойства.
3. Холодная обработка делает металл твёрже и прочнее, но некоторые металлы имеют предел деформации.
4. Перекристаллизация – это рост новых, свободных от деформации зёрен.

Variant 3

1 Find Russian equivalents.

1. tough	a) сплав
2. iron	b) сердечник
3. mandrel	c) выдавливание
4. alloy	d) крепкий

5. extrusion	e) железо

2 Match English word combinations.

1. hydraulic	a) instruments
2. extra	b) drawing
3. metal	c) forging
4. surgical	d) working
5. wire	e) strength

3 Make up sentences.

1. tools, are, steels, high-carbon, used , and, in, cutting, hard, are, brittle, and
2. tempering, tool, is, toughened, by, steel, and, quenching, and, strengthened
3. process, is, most, the, rolling, metalworking, common
4. shapes, can, metals, into, be, useful, deformed, easily

4 Translate into English.

1. Выдавливание (прессование) – это проталкивание заготовки через отверстие штампа.
2. Включение других элементов влияет на свойства стали.
3. Металлы важны в промышленности потому, что они могут легко деформироваться в нужные формы.
4. Сталь прочная и жёсткая, но легко коррозирует.

Keys. (Ответы)

Variant 1	4.
1. 1-b, 2-e, 3-a, 4-c, 5-d 2. 1-c, 2-e, 3-d, 4-b, 5-a 3. 1. Manganese gives extra strength and toughness. 2. The addition of chromium gives extra strength and corrosion resistance. 3. The most common rolled product is sheet. 4. The example of extrusion is the manufacturing of aluminium beer cans.	1.Steel is an alloy of iron and carbon. 2.Steels of low carbon content are quite ductive and are used in the manufacture of sheet iron, wire and pipes. 3.The addition of chromium gives extra strength and corrosion resistance to steel. 4.If the rolling is finished cold, the surface will be smoother and the product stronger.
Variant 2	4.
1. 1-d, 2-c, 3-e, 4-a, 5-b 2. 1-b, 2-d, 3-e, 4-a, 5-c	1. During rolling, punching, drawing, forging and sheet metal forming, metal

3. 1. The inclusion of other elements affects the properties of the steel. 2.Steel is an allow of iron and carbon. 3.Cold working hardens metal to make the part stronger. 4.Extrusion is pushing the billet to flow through the orifice of a die.	is subjected to large amount of strain. 2. The amount of carbon in steel influences its properties considerably. 3. Cold working makes the metal harder and stronger, but some metals have a limit to the strain. 4. Recrystallization is the growth of new strain-free grains.
Variant 3	4.
1. 1-d, 2-e, 3-b, 4-a, 5-c 2. 1-c, 2-e, 3-d, 4-a, 5-b 3. 1.High-carbon steels are hard and brittle and are used in cutting tools. 2.Tool steel is strengthened and toughened by quenching and tempering 3.Rolling is the most common metalworking process. 4.Metals can be easily deformed into useful shapes.	1. Extrusion is pushing the billet to flow through the orifice of a die. 2. The inclusion of other elements affects the properties of the steel. 3. Metals are important in industry because they can be easily deformed into the useful shapes. 4. Steel is strong and tough, but corrodes easily.

Equipment instruments and machine-tools.

Variant 1

1 Match English word combinations.

1. fragile	a) teeth
2. gear	b) metal
3. tool	c) wheel
4. abrasive	d) materials
5. forge	e) holder

2 Complete the sentences.

1. The … is composed of many small grains of ….
2. When metal is … the … is called ….
3. The … is the largest of the … machine tools.
4. … produces parts of circular cross-section by turning the … on its … and cutting its surface with a … stationary….

---

sharp, wheel, lathe, welding, planner, abrasive, reciprocating, workpiece, axis, process, tool, welded.

3 Make up sentences

1. advantages, all, that, with, have, of, tools, equipped, NC, machine, a, are, systems, lot.
2. tools, are, about, kinds, there, machine, 500, of.
3. control, modern, are, under, often, numerical, lathes.
4. specifications, can, they, to, hole, some, according, drill, a.

4 Translate into English.

1. Шлифовальному станку требуется точная регулировка шлифовального диска.
2. Резец может двигаться как вдоль станины, так и под прямым углом к ней.
3. Сверлильные станки отличаются по размеру и функциям.

Variant 2

1 Match English word combinations.

1. remove	a) edge
2. versatile	b) machine
3. drilling	c) metal
4. cutting	d) motor
5. electric	e) machine tool

2 Complete the sentences.

1. The … may be moved … to produce a … part and moved towards the workpiece to control the … of cut.
2. The … to be shaped is called the ….
3. Machine tools with … drive are faster and more … than … tools.
4. If we … metal the … is called ….

---

tool, material, electrical, workpiece, process, accurate, cast, hand, sideways, casting, depth, cylindrical.

3. Make up sentences

1. flat, is, the, used, shaper, to, mainly, different, produce, surfaces.
2. accuracy, flat, be, may, contoured, machined, surfaces, with, finish, excellent, and.
3. to, other, materials, metals, and, machine-tools, used, are, shape.
4. tools, metal-cutting, machine, from, the, remove, material, workpiece, some.

4 Translate into English.

1. Расточка –это процесс, который увеличивает ранее просверленные отверстия.
2. Многоцелевые станки выполняют несколько видов задач.
3. Токарный станок позволяет производить детали круглого сечения.

Variant 3

1. Match English word combinations.

1. hand	a) surfaces
2. milling	b) finish
3. excellent	c) tool
4. numerical	d) machine
5. flat	e) control

2. Complete the sentences.

1. The table has three possible …: longitudinal, … and …
2. If we … metal the … is called ….
3. Angles, …, gear … and cuts can be made by using various … of cutters.
4. … is a process that … holes previously ….

---

slots, process, shapes, roll, drilled, movements, vertical, boring, rolling, teeth, enlarges, horizontal.

3. Make up sentences.

1. tasks, centers, carry, of, kinds, machining, out, several.
2. wheel, by, grinders, metal, a, abrasive, remove, rotating.
3. products, nowadays, tools, role, manufacture, of, an, the, almost, metal, all, machine, play, important, in.
4. are, the, machines, metal-cutting, of, examples, lathes.

4 . Translate into English.

1. Все современные токарные станки оборудованы электроприводами.
2. Фреза фрезерного станка – это круглое приспособление с режущими остриями на своей окружности.
3. Если мы вращаем металл, то процесс называется вращением.

Keys (Ответы)

Variant 1

1. 1-d, 2-a, 3-e, 4-c, 5-b

2. 1.Wheel, abrasive
   2.Welded, process, welding
   3.Planner, reciprocating
   4.Lathe, workpiece, axis, sharp, tool

3. 1.All machine tools that are equipped with an NC systems have a lot of advantages.
2.There are about 500 kinds of machine tools.
3.Modern lathes are under numerical control.
4.They can drill a hole according to some specification.

4. 1. The grinding machine requires fine wheel regulation.
2. The cutter can be moved both along the lathe bed and at right angle to it.
3. Drilling machines are different in size and function.

Variant 2

1. 1-c, 2-e, 3-b, 4-a, 5-d

2. 1.tool, sideways, cylindrical, depth
   2.material, workpiece
   3.electrical, accurate, hand,
   4.cast, process, casting,

3. 1.The shaper is used mainly to produce different flat surfaces.
2.Flat and contoured surfaces may be machined with excellent finish and accuracy.
3.Machine tools are used to shape metals and other materials.
4.Metal-cutting machine tools remove some material from the workpiece.

4. 1. Boring is a process that enlarges holes previously drilled.
2. Machines centers carry out several kinds of tasks.
3. Lathe produces parts of circular cross-section.

Variant 3

1. 1-c, 2-d, 3-b, 4-e, 5-a

2. 1.movements, horizontal, vertical
   2.roll, process, rolling
   3.slots, teeth, shapes
   4.boring, enlarges, drilled

3. 1.Machining centers carry out several kinds of tasks.
2.Grinders remove metal by a rotating abrasive wheel.
3.Nowadays machine tools play an important role in the manufacture of almost all metal products.
4.The examples of the metal cutting machines are lathes.

4. 1 .All modern lathes are power-electrically driven.
2.In a milling machine the cutter is a circular device with a series of cutting edges on its circumference.
3.If we roll metal the process is called a rolling.

ПРИМЕРНЫЕ ЗАДАНИЯ К ОБЯЗАТЕЛЬНОЙ КОНТРОЛЬНОЙ РАБОТЕ

I. Match the words. (Соедините слова с переводом)

Ex. 1

1. forging	a) хрупкий
2. blade	b) лист
3. brittle	c) ковка
4. sheet	d) зазор
5. grinder	e) лезвие
6. gap	f) шлифовальный станок

Ex.2

1. resist	a) состояние
2. lathe	b) отливать
3. welding	c) сопротивляться
4. condition	d) токарный станок
5. cast	e) сварка
6. treatment	f) обработка

II. **Make up word combinations**. (Составьте словосочетания)

Ex.1

1. yield	a) die
2. forming	b) arc
3. hydraulic	c) point
4. gas-metal	d) forging
5. lower	e) operation

Ex.2

1. cue	a) rod
2. crystalline	b) dioxide
3. carbon	c) lathe
4. feed	d) stress
5. cycling	e) structure

III. Complete the sentences using the words below. (Восстановите пропуски, используя слова после текста)

Ex.1

Drawing consists of 1 … metal through a die. One type is wire drawing. The diameter 2 … that can be 3 … in one die is limited, but several dies 4 … can be used to get the desired reduction. Sheet metal forming (штамповка листового металла) is widely used when parts of certain shape and size are needed. It includes forging, bending and shearing. One characteristic of sheet metal farming is that the thickness of the sheet changes little in processing. The metal is stretched just beyond its 5 … (2 to 4 percent strain) in order to retain the new shape. 6 … can be done by *pressing* between-two dies. 7 … is a cutting operation similar to that used for cloth. Each of these processes may be used alone, but often all three are used on one part. For example, to make the roof of an automobile from a flat sheet, the 8 … are gripped and the piece pulled in tension over a9 … . Next an upper die is pressed over the top, finishing the 10 … (штамповку), and finally the edges are sheared off to give the final dimensions.

---

forming operation, reduction, shearing, in series, yield point, bending, edges, achieved, pulling, lower die

Ex.2

Engineering products and objects are made of 1… . Such materials as glass, 2 … (or timber), ceramics, plastic, rubber, 3 … , iron, pig iron, cast iron, gold, silver, tin, 4 … , lead, aluminium are called engineering materials.

There are two kinds of engineering materials: metals and non-metals. 5 … , cast iron, pig iron, copper, tin, zinc, lead, aluminium, gold, silver are examples of metals. Glass, ceramics, wood, plastic and 6 … are examples of non-metals. Both metals and non-metals have 7 … because of which they are used in making engineering products.

Metals have always been the most important for the 8 … . Metals' special properties are
9 …, wear resistance, 10 … (or malleability).

---

certain properties, ductile properties, copper, engineer, wood, engineering materials, rubber, electrical conductivity, zinc, steel

IV. Make up sentences. (Составьте предложения из предложенных слов)

Ex.1

1. considerably, its, the, carbon, influences, properties, amount, steel, a, in, of.
2. motors, by, nowadays, lathes, all, are, electric, power-driven.
3. groups, processes, divided, broad, metalworking, can, into, be, five
4. shape, the, without, machines, workpiece, removal, from, material, any, metal-forming, of, it, the.
5. is, than, harder, stronger, and, aluminium, copper.

Ex.2

1. cold, can, rolling, hot, either, done, be, or.
2. tools, the, control, more, controls, than, machine, direct, 100, numerical, computer.
3. to, corrosion, able, are, metals, some, resist.
4. or, vertical, machines, basically, classified, as, milling, horizontal, are.
5. permanent, fabrication, either, joining, pieces, involve, temporary, processes, or.

V. Translate into English. (Переведите на английский язык)

Ex.1

1. Каждая мастерская должна быть оборудована многоцелевыми станками.
2. Токарный станок считается основным станком.
3. Для того чтобы увеличить производство металла, необходимо применить новые методы его выплавки.
4. Высадка используется для изготовления головок гвоздей и болтов.
5. Рычаги и шкивы не называют механизмами.

Ex.2

1. Метал с мелким зерном тверже, чем с крупным зерном.
2. Производство включает превращение сырья в готовую продукцию, которая будет использоваться для различных целей.
3. Ковка является одним из ведущих технологических процессов современной промышленности
4. Края листа при штамповке отрезаются для получения конечных размеров.
5. Экологическая безопасность - это термин, используемый учеными и практиками для установления связи между условиями окружающей среды и интересами безопасности.

Keys (Ответы)

I. Match the words.

Ex. 1. 1-c, 2-e, 3-a, 4-b, 5-f, 6-d

Ex. 2. 1-c, 2-в, 3-e, 4-a, 5-b, 6-f

II. Make up word combinations.

Ex. 1. 1-c, 2-e, 3-d, 4-c, 5-a

Ex. 2. 1-c, 2-e, 3-b, 4-a, 5-d

III. Complete the sentences.

Ex. 1.

1. pulling
2. reduction
3. achieved
4. In series
5. yield point
6. bending
7. shearing
8. edges
9. lower die
10. forming operation

Ex. 2.

1. engineering materials
2. wood
3. copper
4. zinc
5. steel
6. rubber
7. certain properties
8. electrical conductivity
9. engineer
10. ductile properties

IV.Make up sentences.

Ex. 1.

1. Rolling can be done either hot or cold.
2. Nowadays all lathes are power-driven by electric motors.
3. Metalworking processes can be divided into five broad groups.
4. Metal-forming machines shape workpiece without the removal of any material from it.
5. Copper is harder and stronger (stronger and harder) than aluminum.

Ex. 2.

1. Rolling can be done either hot or cold (cold or hot).
2. The direct numerical control computer controls more than 100 machine tools.
3. Some metals are able to resist corrosion.
4. Milling machines are basically classified as vertical or horizontal (horizontal or vertical).
5. Fabrication Processes involve joining pieces either temporary or permanent (permanent or temporary).

V.Translate into English.

Ex. 1.

1. Each workshop should be equipped with multi-purpose machines.
2. Lathe is considered the main machine.
3. To increase the output of metal it; is necessary to apply new methods of smelting.
4. Upsetting is used to form the head of a nail or a bolt.
5. Levers and pulleys are not called mechanisms.

Ex. 2.

1. A metal with small grain is stronger than one with coarse grains.
2. Manufacturing involves turning raw material to finished products, to be used for various purposes.
3. Forging is one of the leading technological processes of modern industry.
4. The edges of the sheet during stamping are cut off to obtain a finite size.

Environmental security is a term used by scholars and practitioners to state connection between environmental conditions and security interests.

ВОПРОСЫ ДЛЯ САМОКОНТРОЛЯ

MAIN COURSE

Mechanical engineering.

1. When was Mechanical engineering recognized as a separate branch of engineering?
2. What does mechanical engineering deal with?
3. Why are lists of the professional divisions and technical committees of the American Society of Mechanical Engineers (ASME) given?
4. When did machines appear?
5. Who were the forerunners of modern engineers?
6. What are the main trends in modern machine-building?
7. What is the third important trend in machine-building?
8. What does the training of future engineers include?

Applying for a job. Writing resumes (CVs*)

1. What is your future speciality?
2. Who/what influences your career choice? For example - family, money, peers, you, other? What influence do they have over your choice? What do you think of that?
3. What are your main tasks?
4. What skills are required in your position on a day-to-day basis?
5. What parts of your job do you find most challenging?
6. What are you really good at?
7. What do find most enjoyable?
8. Could you describe one of your typical workdays?
9. How do you want to describe yourself in relation to your career when you meet someone new?
10. Where do you see yourself working?

Equipment instruments and materials

Instruments

1. What are pliers used for?
2. What do the pliers consist of?
3. What is the function of pliers, jaws and handles?

4. What material are bench-shears made of?
5. What are the bench-shears provided with?
6. What purposes are alligator shears used for?
7. What principal parts do the alligator shears consist of?
8. What purpose are pipe-cutters used for?
9. What parts does a pipe-cutter: consist of?
10. What instruments are used for disassembling and assembling machine parts?
11. How are wrenches subdivided?
12. What is a nut wrench used for?
13. What wrenches are used for screwing and unscrewing nuts?
14. What tools are used for filing operations?
15. What operations are performed with a file?
16. What is the difference between a file and a chisel?
17. What machine- cutting tools do you know? What are they used for?
18. What parts does a cutting tool consist of?
19. What other mechanical tools can be used in repairing?

Engineering materials

1. What are metals and what do wo call metallurgy?
2. Why are most metals dense?
3. Why are metals malleable? Why are metals malleable?
4. What are grains? What is alloying?
5. What is crystalline structure?
6. What do the properties of metals depend on?
7. What changes the size of grains in metals?
8. Why are metals so important in industry?
9. What types of metals do you know?
10. What is steel?
11. What are the main properties of steel?
12. What the drawbacks of steel?
13. What kinds of steel do you know? Where are they used?
14. What gives the addition of manganese, silicon and chromium to steel?
15. What can be made of mild steels (medium-carbon steels, high-carbon steels)?
16. What kind of steels can be forged and welded?
17. How can we get rust-proof (stainless) steel?
18. What is used to form a hard surface on steel?
19. What are 'high-speed steels alloyed with?
20. What is creeping?

21. What is the density of a material?
22. What are the units of density? Where low density is needed?
23. What are the densities of water, aluminium and steel?
24. A measure of what properties is stiffness? When stiffness is important?
25. What is Young modulus?
26. What is strength?
27. What is yield strength? Why fracture trength is always greater than yield strength?
    What if ductility? Give the examples of ductile materials. Give the examples of brittle materials,
28. What is toughness?
29. What properties of steel are necessary for the manufacturing of: a) springs, b) ear body parts, e) bolts and nuts, d) cutting tools?
30. Where is aluminium mostly used because of its light weight?

Machine-Tools

1. What is a machine?
2. What simple machines do you know?
3. What is the main part of every machine?
4. What is milling machine used for?
5. What main parts does the milling machine consist of?
6. How are milling machines classified?
7. What part is called knee?
8. What is the knee used for?
9. What part rests upon the knee?
10. What is grinding machine used for?
11. How are grinding machines classified?
12. What are the characteristic features of a universal cylindrical grinder?
13. What is the main feature of grinding machines?
14. What are bench grinders used for?
15. For what type of work is the cylindrical grinder used?
16. What types of grinding machines are used for finishing internal surfaces of cylindrical or conical shape?
17. Why are centreless grinding machines called so?
18. What type of work is the surface grinder designed for?

Manufacturing and Technological Processes

1. What are the main processes of metal forming?

2. What is the difference between the arc-welding and non-consumable electrode arc welding?
3. What are the disadvantages of the non-consumable electrode arc welding?
4. How is electrode protected from the air in gas-metal arc welding?
5. What is submerged arc welding?
6. What is the principle of resistance welding?
7. What are the main metalworking processes?
8. Why are metals worked mostly hot?
9. What properties does cold working give to metals?
10. How can the reduction of diameter in wire drawing be achieved?
11. What is sheet metal forming and where it can be used?
12. What is forging?
13. What is close-die forging?
14. What is rolling? Where is it used?
15. What is extrusion? What shapes can be obtained after extrusion?
16. What are the types of extrusion?
17. What are the types of forging?
18. What types of hammers are used now?
19. Where an coining and upsetting used?
20. What process is used in wire production?
21. Describe the process of making the roof of a car?
22. What process is called milling?
23. What is grinding?

Recourses Saving Technologies

1. What is Environmental security?
2. What resource-saving technologies do you know?
3. What are the negative ecological impacts of technology?
4. Is materials technology changing nowadays?
5. What do new manufacturing processes include?
6. What are they aimed at?
7. Can complicated parts be manufactured by welding together simpler sub-units?
8. Can these assemblies be made from a variety of materials?
9. What has the brief review of new materials and processes indicated?
10. Why is it necessary for an engineer to know these processes?

Перечень учебных изданий и информационно-аналитических материалов, рекомендуемых для изучения учебной дисциплины

Учебная литература

1. Английский язык. Профессиональное общение = Professional Communication Course: учебное пособие / И. Н. Пузенко, И. М. Веренич, Н. В. Вербицкая. - Гомель : Издательство «Гомельский государственный технический университет им. П.О. Сухого», 2012. – 262 с.
2. Бгашев, В.Н. Английский язык для студентов машиностроительных специальностей : учеб. / В.Н. Бгашев, Е.Ю. Долматовская. — 3-е изд., испр. и доп. — М.: Астрель : АСТ, 2007. — 381 с.
3. Маркова, Ю.В. Английский язык в области машиностроительных технологий и оборудования : учеб. пособие / Ю. В. Маркова. – Комсомольск-наАмуре : ФГБОУ ВПО «КнАГТУ», 2015. – 103 с.
4. Митрошкина, Т.В. Справочник по грамматике английского языка в таблицах. / Т.В. Митрошкина - Минск: Тетралит, 2014. – 96с.
5. Хведченя, Л.В. Грамматика английского языка: учеб. пособие / Л.В.Хведченя. – Минск: Издательство Гревцова, 2011. – 480 с.
6. Ядрищенская, С.В. Английский язык для машиностроителей: учеб.-метод. комплекс/ С.В. Ядрищенская - Новополоцк: ПГУ, 2008. – 328 с.
7. Хоменко, С. Basic English for Technical Students/ С.А. Хоменко [и др.] – Минск: Вышэйшая школа, 2009. - 368 с.
8. Evans, V. Career Paths (Electrician 1) / V. Evans, J.Dooly, T. O'Dell– Express Publishing, 2012..- 39 p.
9. Evans, V. Career Paths (Electrician 2) / V. Evans, J.Dooly, T. O'Dell– Express Publishing, 2012..- 39 p.
10. Evans, V. Career Paths (Electrician 3) / V. Evans, J.Dooly, T. O'Dell– Express Publishing, 2012..- 39 p.
11. Brieger, N. Technical English. Vocabulary and Grammar/ Nick Brieger, Alison Pohl. - Summertown publishing, 2014. – 148 p
12. Dearholt, Jim D. Career Paths (Mechanics 1)/ Jim D. Dearholt. – Express Publishing, 2014. – 39 c.
13. Dearholt, Jim D. Career Paths (Mechanics 2)/ Jim D. Dearholt. – Express Publishing, 2014. – 39 c.
14. Dearholt, Jim D. Career Paths (Mechanics 3)/ Jim D. Dearholt. – Express Publishing, 2014. – 39 c.

Словари

1. Краткий англо-русский технический словарь / Ю.А. Кузьмин и др. - М.:ММПШ, 1991. - 416 с.
2. Он-лайн словарь «Мультитран» https://www.multitran.ru/

Электронные ресурсы

1. Он-лайн энциклопедия www.britanica.org
2. Он-лайн энциклопедия www.wikipedia.org