

- Chapter 1-3, chapter 10, chapter 9, chapter 11, chapter 12, chapter 14, chapter 13, tragedy of the commons,
-
- Lecture 1
 - 5 major components to ECOR 1010
 - Professional practice
 - Health and Safety
 - Engineering Analysis
 - Engineering Design
 - Technology, Society and the Environment (TSE)
 - Reverse Engineering
 - The process of taking an existing product, measuring and evaluating it, and creating a CAD database to reproduce it
 - TSE's
 - First rate technical knowledge → engineering, science & math
 - Create what has not been → innovation & design skills
 - Not only do things right, but know what to do → critical thinking & problem solving
 - Connect ethical, political, international studies environmental, economic factors → humanities / complementary
 - Aim of Engineering Profession
 - Put technical knowledge to work for society
 - Catalyze private sector to create wealth
 - Keep in mind environmental sustainability
 - Life expectancy has risen as a result of technology and engineering
 - Solar Impulse
 - Plane which was able to fly around the world without any fuel using solar energy
- TSE 1
 - Exo-Somatic Energy: Energy outside the body
 - Abundant cheap energy cause explosive growth of human society
 - Petroleum has affected so many social/economic/tech things in world
 - Agriculture caused large human population growth before 1800s
 - Petroleum huge factor in huge population growth after 1800s
 - 2 Reasons to stop using fossil fuels
 - Causes drastic climate change
 - Running out of accessible fossil fuels (finished this century)
 - Consumption of oil more than discoveries since 1984
 - Over 100 years
 - Energy use is going to go up higher than population growth
 - Coal is going to be used more (1/2 of energy)
 - Oil will be used less
 - More nuclear and wind energy (6% each)

- More wealthy people
 - 89% energy consumption non-renewable, 11% renewable
 - Can grow GDP while using less energy+emissions
 - Temperature and sea rise will occur due to global warming
 - Temp. will 1.8-4 celsius over 100 years
 - Sea rise 18 to 59 cm
 - Sustainable development
 - Development that meets the needs of the present without taking away from the future
- Lecture 2
 - What is Engineering?
 - Problem Solving and critical thinking
 - Design
 - Professionalism
 - A person who uses science, mathematics, experience, and judgement to create, operate, manage, control, or maintain devices, mechanisms, processes, structures, or complex systems. Does this in a rational and economic way with human, societal, and natural resources and environmental constraints.
 - The creative application of scientific principles to design or develop structures, machines, apparatus, or manufacturing processes, or works utilizing them singly or in combination
 - Comes from the word Ingenium
 - Started out as people who made war weapons
 - Key Link between theory and practical applications
 - Canadian Engineering Accreditation Board (CEAB) evaluates engineering programs in Canada
 - Program can be accredited for max 6 years
 - Professional Engineer
 - Must demonstrate competence
 - Be licensed by professional engineering association
 - Requirements:
 - Practical Experience of 4 years
 - Completion of Professional Practice Exam
 - Good character
 - Technician
 - Works under supervision of engineer in practical parts of engineering
 - Education comes from community college
 - Can be certified but does not need to be
 - Skilled Worker
 - Carries out the plans of others
 - Engineering Accomplishments
 - Transcontinental railway

- De Havilland Beaver
 - St. Lawrence Seaway
 - Athabasca Oil Sands
 - Very High Voltage Transmission
 - CANDU Reactor
 - Alouette Satellite
 - Canadarm
 - Confederation bridge
 - IMAX
 - Pacemaker
 - CN Tower
- Quebec bridge collapsed, iron ring
- Lecture 3
 - Report writing
 - Date and Sign Everything Written
 - Avoid Jargon + fancy words
 - No adverbs
 - Strong subjects
 - No verbs turned into nouns
 - Report Qualities
 - Statement of Purpose
 - Logical development of data and ideas
 - Adequate references
 - Separation of opinions and facts
 - Detailed parts of report
 - Title page
 - Abstract/executive summary
 - Table of Contents + list of figures/tables
 - Introduction
 - Method
 - Results and discussion
 - Conclusions
 - Acknowledgments
 - References
 - Appendices
 - Data tables
 - Graphs
 - Drawings
 - Other examples:
 - Resume
 - Covering letter
 - Internal memo
 - Project proposals

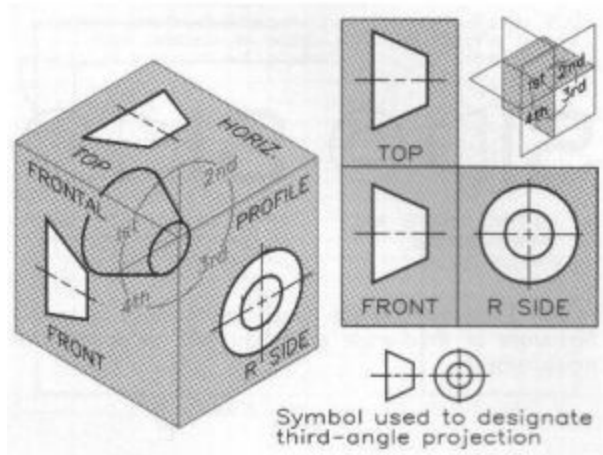
- Technical Research papers
 - Patents
- Measurements
 - Measurement: Physical quantity that has been observed
 - Comprised of numerical magnitude and symbol
 - Unit: Standard quantity
 - A dimension never changes
 - However changing the unit will change the magnitude of the measurement
 - Derived unit: Unit derived from base units i.e. Newtons
 - Unit systems
 - Système International d'Unités (SI)
 - 7 base units:
 - Metre (length)
 - Kilogram (mass)
 - Second (time)
 - Ampere
 - Kelvin
 - Candela
 - Mole
 - Absolute system
 - Mass is fundamental unit
 - FPS unit system
 - Gravitational System
 - Force is fundamental unit
 - Units
 - Feet (length)
 - Pounds (force)
 - Seconds (time)
 - American System
 - Hybrid System
 - Units
 - Pounds force (force)
 - Feet (length)
 - Seconds (time)
 - Pounds mass (mass)
- TSE 2
 - Rachel Carson "Silent Spring" showed pesticides damage human health
 - CFCs depleting Ozone
 - Antarctica ozone found
 - Montreal Protocol
 - Focused on depletion of CFCs
 - One of the most successful international environmental agreements

- Kyoto Protocol
 - Unsuccessful
 - Not all problems have technical solutions, must accept lifestyle changes
 - Paris agreement
 - Limit global temperature increase to 1.5 celsius
 - Canada called for 1.5 celsius increase not 2
 - Top 20% receive 80% wealth
 - 20% of population:
 - Consume 75% timber
 - Consume 80% paper, iron and steel
 - 65% meat, fertilisers and cement
 - 50% of fish and grain
 - 85% aluminum and synthetic chemicals
 - Produce 95% cfcs
 - Consume 40% fresh water
 - Produce 96% radioactive waste
 - Consume 80% energy
 - Engineering for Sustainability
 - Innovative design in alternative energy sources and energy efficiency
 - Produce solution which is good scientifically and economically
 - Life Cycle Analysis
 - Determines environmental impact of product for material to disposal
 - Brundtland Report
 - "A production base that respects ecological base and technological system that continues to find new solutions"
- Lecture 4

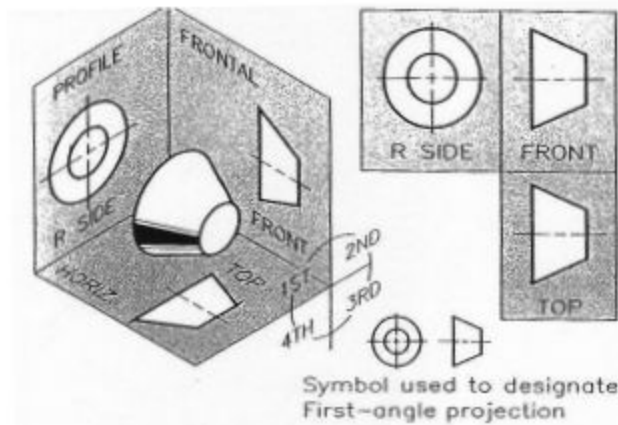
Y	yotta	10^{24}	M	mega	10^6	f	femto	10^{-15}
Z	zetta	10^{21}	k	kilo	10^3	a	atto	10^{-18}
E	exa	10^{18}	m	milli	10^{-3}	z	zepto	10^{-21}
P	peta	10^{15}	μ	micro	10^{-6}	y	yocto	10^{-24}
T	tera	10^{12}	n	nano	10^{-9}			
G	giga	10^9	p	pico	10^{-12}			

- Fixed notation is regular number
- Engineering notation is number to the power of 10 to the multiple of 3
 - 30.14×10^3
- Dimensions are the things being measured
 - Length, acceleration, speed
 - Derived dimension come from ratio of base dimensions
- Uncertainty interval :An interval estimate of where true value lies
- Measurement error = True Value- Measured Value
- Bias: Constant deviation from true value

- Gives actual size of face
 - Isometric (Axonometric)
 - Axis are each 120 degrees apart
 - Shows more than 2 faces
- Orthographic projection
 - Third angle



- - 1st angle

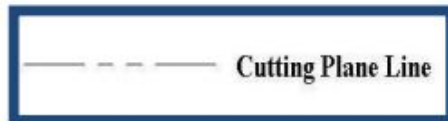


- - Selection of views
 - Most descriptive view is front view
 - Remaining views should be selected with least hidden lines
 - If there's a tie, use top/right

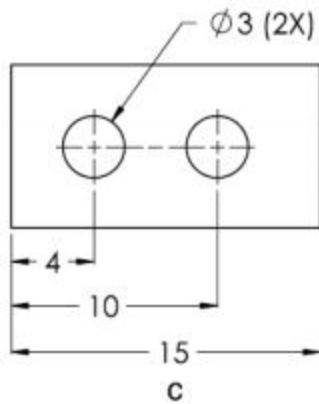
- TSE 3

- Environmental Sustainability steps
 - Attack waste
 - Attack emissions
 - Renewable Energies
 - Close cycles (reuse)
 - Resources/Good transportation (keep factories close to consumer)
 - Redesign commerce

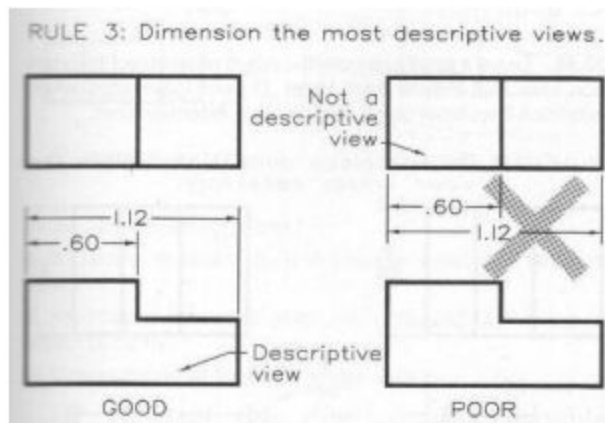
- Lecture 6
 - Graphical Mathematics
 - Solving algebraic equations using graphical techniques
 - Nomography
 - Calculating chart with scales that contain 3 or more variables
 - Empirical equations
 - Use mathematical equations to relate to data
 - Can be either from curve fitting or derived from physics theory
 - CAD (Computer Aided Drafting)
 - Advantages
 - Increased accuracy
 - Increased speed
 - Easy revision
 - Better design analysis
 - Better presentation
 - Libraries of drawing aids
 - Improved filing
 - Solid modeling
 - Creates 3d virtual models to see how/if things will work
- Lecture 7
 - Precedence of lines
 - 1. Visible object lines
 - Indicate all visible edges of object
 - 2. Hidden lines and cutting plane lines
 - Hidden: Show object lines hidden from view
 - Cutting: Indicates edge view of imaginary cutting plane
 - 3. Centre lines
 - Indicates centres of holes and symmetrical features
 - 4. Extension and leader lines
 - Lines



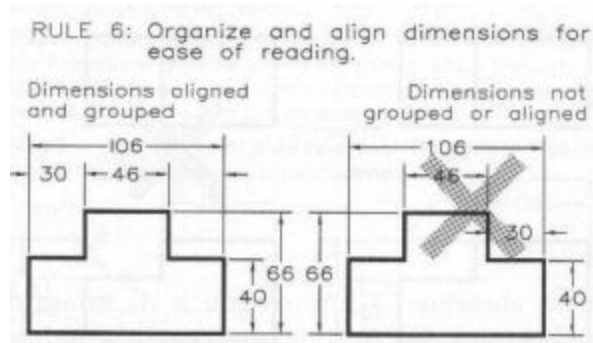
- Rules of dimensioning
 - No redundancy of dimensions
 - Dimension from visible lines only
 - Give overall dimension, omit last dimension in chain



- Place dimensions between view sharing same dimension
- Dimension descriptive view



- Keep dimensions grouped



- - Do not duplicate dimensions
 - Do not cross dimension lines
 - Extension lines may cross one another, leave space between line and object
 - Do not leave gaps when lines cross
 - Dimension cylinder in rectangular view
 - Dimension holes where they look like holes
- TSE 4
 - Common Pool Resources
 - A natural or human-made resource system that 'belongs' to everyone, but because of its size, and characteristics, it is difficult to control how people use it.
 - Problems with no technical solutions
 - Solutions to common pool resources
 - Add Incentive to do right thing/ add deterrent to do wrong thing
 - Educate society on what right thing is
 - Appeal to conscious/ shame those who do wrong thing
 - Force people to do right thing (physical/ticket/fine)
 - Negative Externality
 - When someone negatively affects another person/society by doing something
- Lecture 8
 - Engineering design
 - Identifying and solving problems and implementing the solutions
 - Design problems
 - Systems design
 - Putting together and combining available products to produce a desired result
 - Product design
 - Design and manufacture of mass-produced goods
 - Method of Design
 - Recognition of need

- Statement of Requirements
 - Definition of the design problem
 - Definition of the design criteria
 - Standards + constraints
 - The design loop
 - Synthesis
 - Analysis
 - Decision-making
 - Optimization
 - Evaluation
 - Communication
 - Code:
 - Specification of the designing of the product
 - Standard
 - Specification of the materials/parts used
 - Design reports
 - Cover
 - Letter of Transmittal
 - Title Page
 - Abstract/Executive Summary
 - Table of Contents
 - List of figure/tables
 - Acknowledgements
 - Introduction
 - Method
 - Body
 - Discussion
 - Conclusions
 - Recommendations
 - Appendix
 - References
- Lecture 9
 - CREO
 - Parametric
 - The values of the parameters assigned to the dimensions of the model features define the physical shape of the part
 - 3D Printing
 - Process
 - Create cad model
 - Convert cad model to stl
 - Slice stl to thin cross-sectional layers
 - Build model by putting layer on top of layer
 - Clean and finish model

- STL
 - Stereolithography
 - Stores outer/inner surface of object as facets
- Rapid prototyping
 - Additive
 - Lays down material and puts layer on layer to make part
 - Subtractive
 - Cuts material away to make object
- Additive Rapid Prototyping techniques
 - Stereolithography
 - Favourite in aerospace industry
 - Laminated Object Manufacturing
 - Selective Laser Sintering
 - Fused Deposition Modeling
 - The Dimension 3-D printer uses FDM process
 - Solid Ground Curing
 - 3-D Ink-Jet Printing
 - Z-Corp 400 3D printer uses Ink Jet Printing

When do you use only 2 views?