TEP TEPE

Introduction to Mechanical Engineering Profession

Dulyachot Cholaseuk

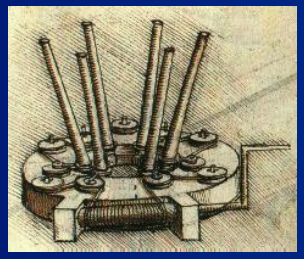
Why people want to be a Mechanical Engineer?

- Personal interest
- Interested in machine
- Easy to find job
- The country need engineers
- Want to invent
- Love cars
- My parents want me to be
- Not sure
- …

Engineering

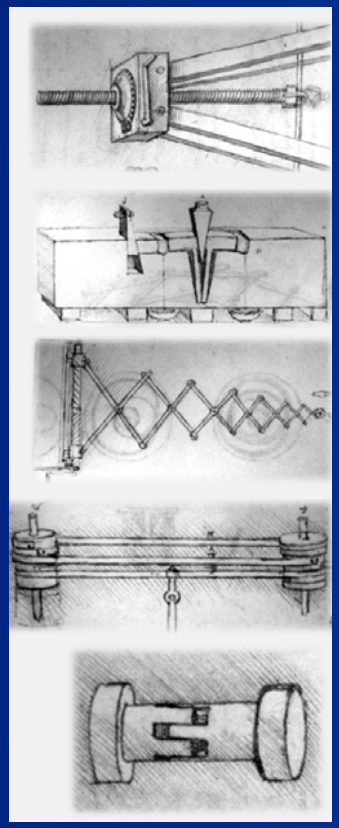
- The art and science by which the properties of matter are made useful to man, whether in structures, machines, chemical substances, or living organisms

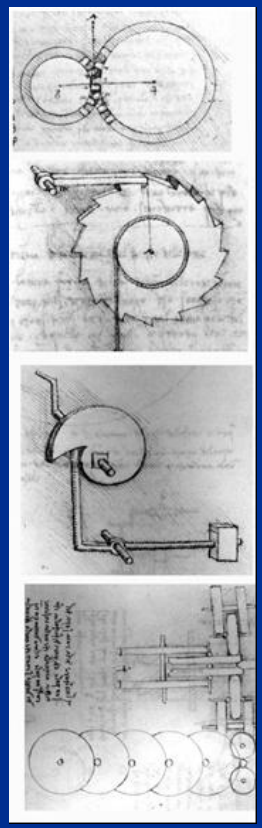
- The discipline dealing with the art or science of applying scientific knowledge to practical problems


Mechanical Engineers Do What?

- **Transmit, transform or make use of energy.**
- **Energy**
  - Heat
  - Kinetic Energy
  - Potential Energy
    - Gravitational
    - Elastic
    - …



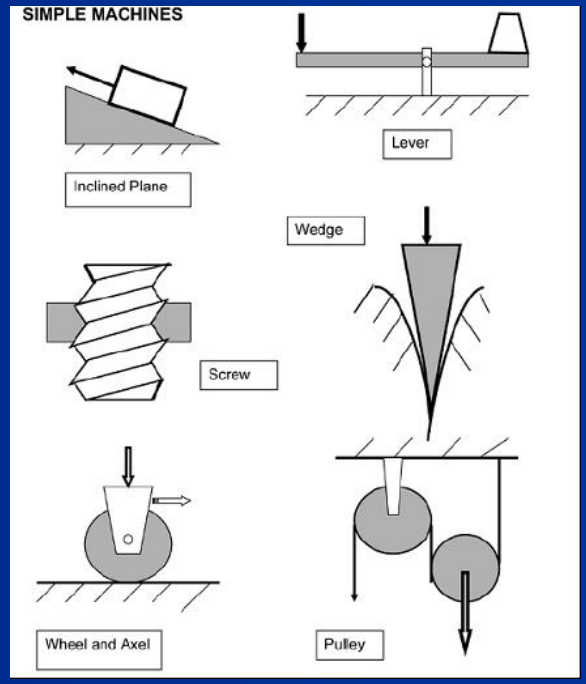


Mechanical Engineering is Part of Evolution

- **Second oldest engineering major of mankind.**
- **Civilization began with *Fire* and *Wheels.* (see *2001*)**

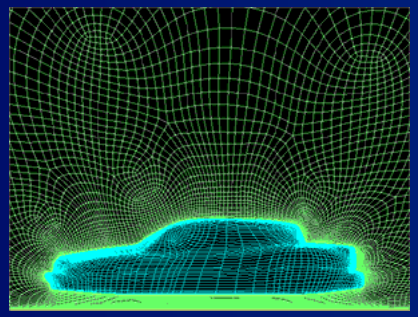
Give me a place to stand

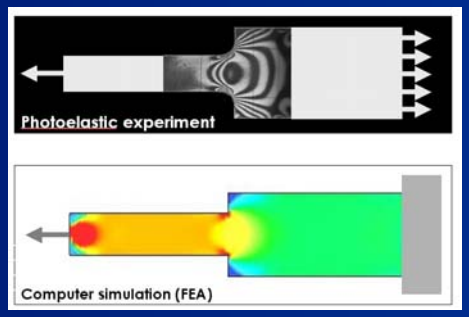
and I will move the earth.



Mechanical Engineers

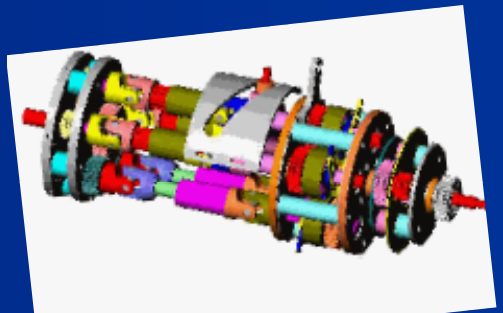
- Know maths and science well.
- Understand and predict related phenomena.
- Apply the knowledge to practical situation.
- A profession regulated by Council of Engineers.

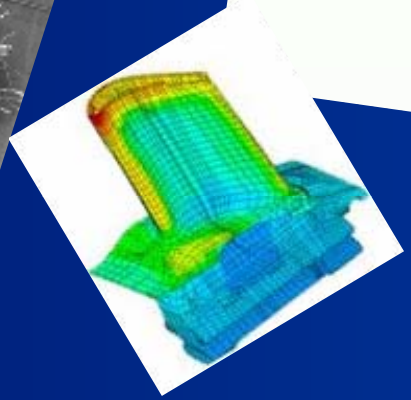




Major Areas of Mechanical Engineering

- Heat and Energy
- Fluid Mechanics
- Dynamics, Vibrations and Controls.
- Solids and Machine Design





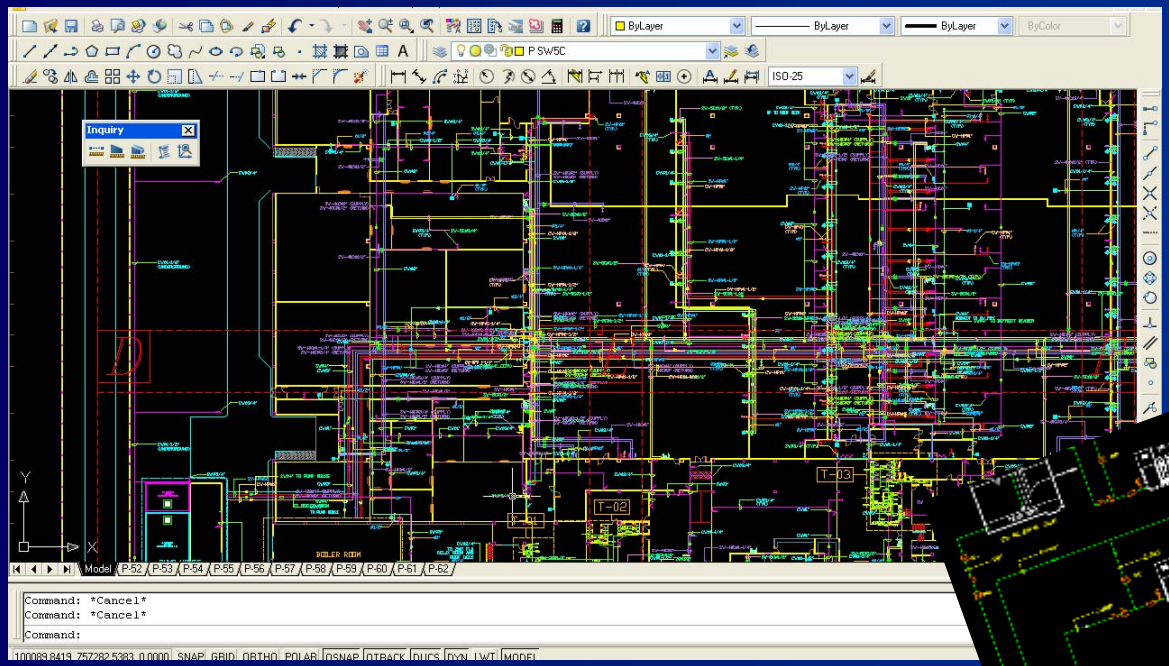
Careers

- **Professional Engineers**
  - Operation and Development of Production Processes.
  - Supervision of Construction Projects.
  - Maintenance of Machines
  - Design
  - Provide Consultation
- **Others**
  - Research
  - Innovation
  - Teach
  - Management
  - Salesperson
  - Etc.

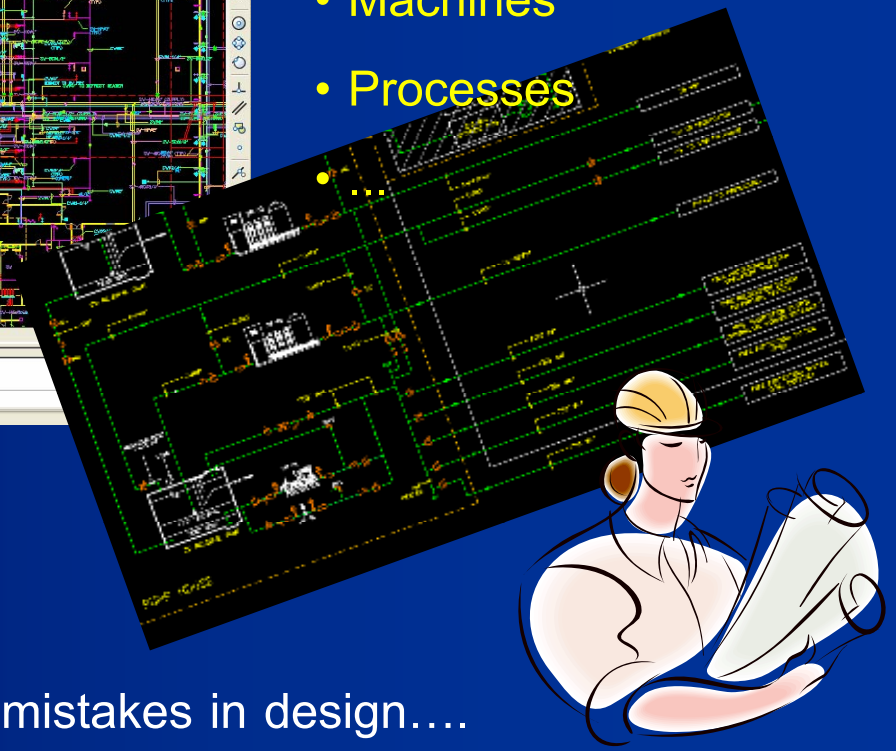
Operation and Development of Production Processes.

- Problem solving
- Process improvement
- Quality control
- Safety Engineer
- ...

Design



- Structures
- Systems
- Machines
- Processes
- ...



Every line will be built.

Mistakes in exam reduce the score but mistakes in design….

Supervision

Education provides some knowledge and leads to systematic thinking.

The rest is learnt from experiences (or mistakes).

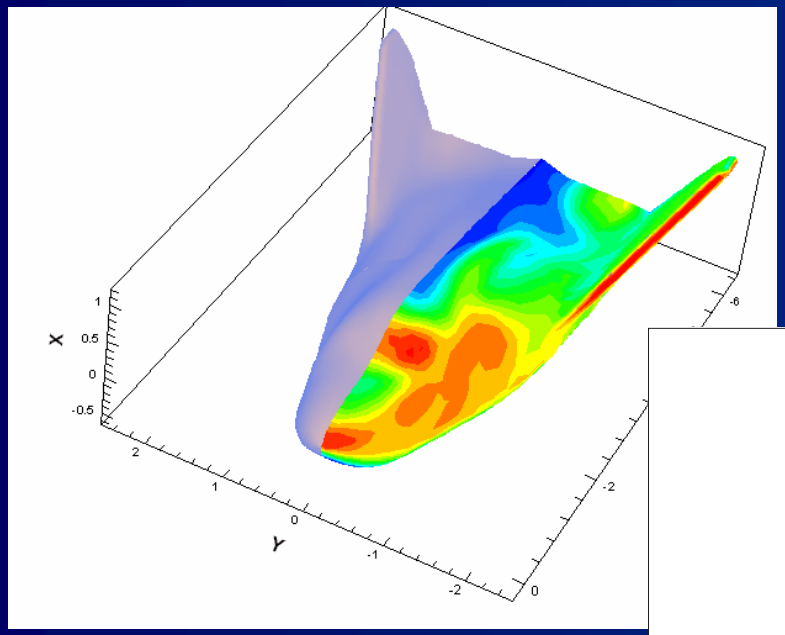
Consultation

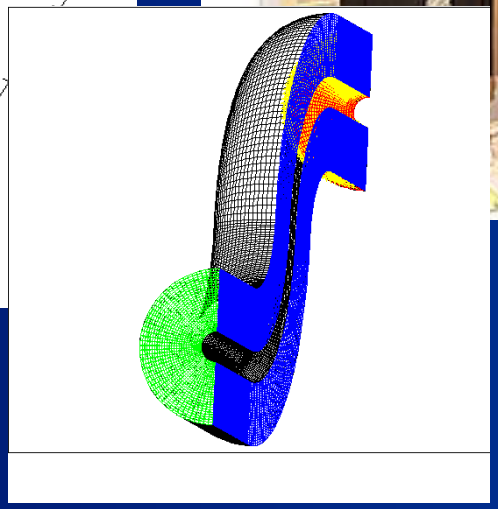
Consultants must have Knowledge + Experience.

Teaching

Education help developing the country.

Research,Development, Invention

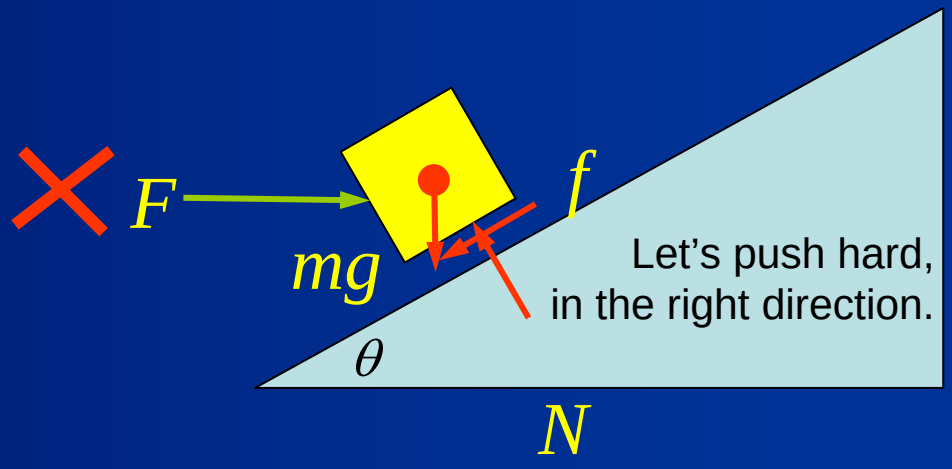




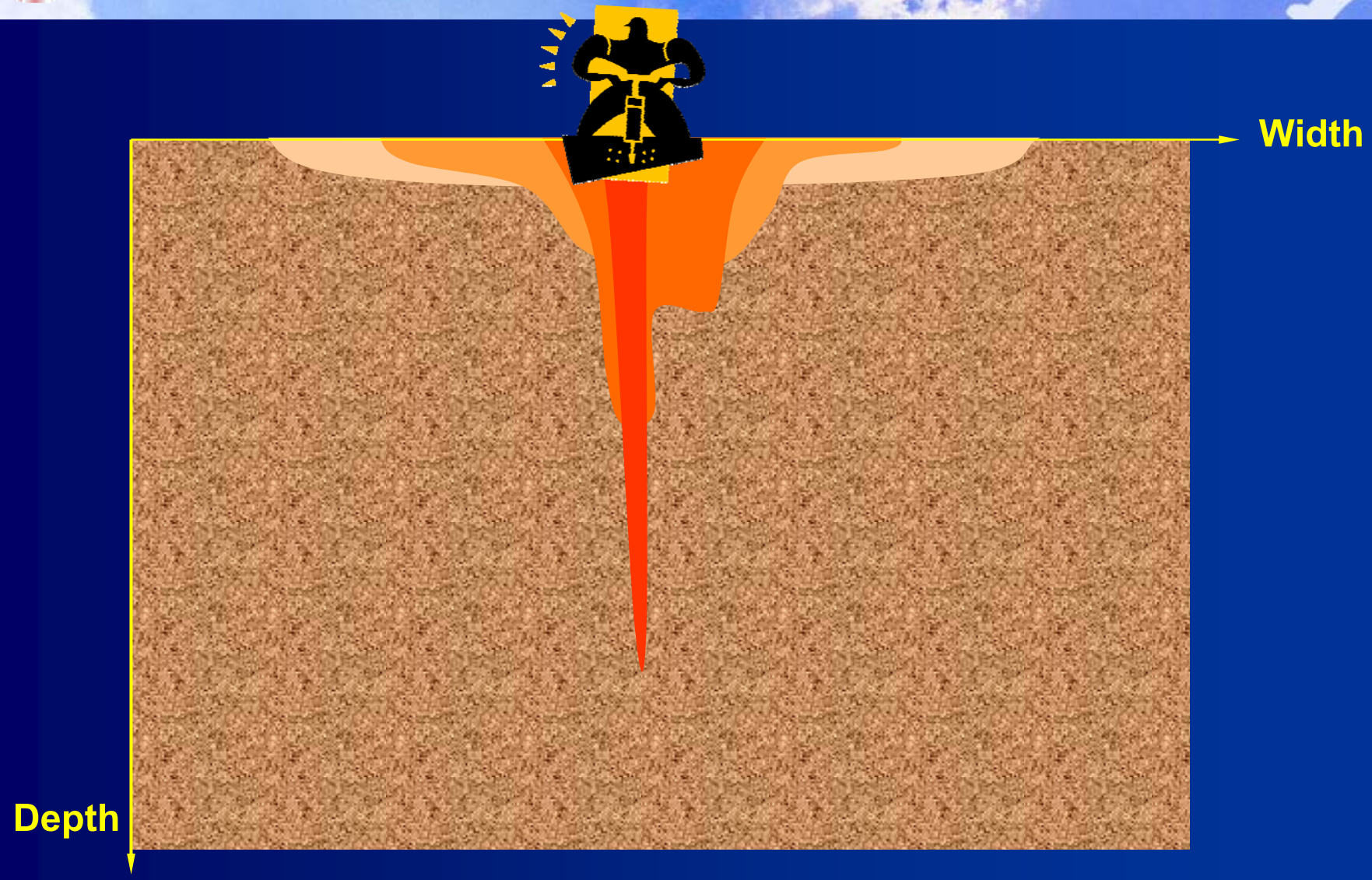
When you have nothing to do, lets conduct a research to find out what to do.

Qualifications

- Hard working.
- Systematic.
- Attention to detail.
- Eager to learn new technology.



Overall Picture



Curriculum Overview

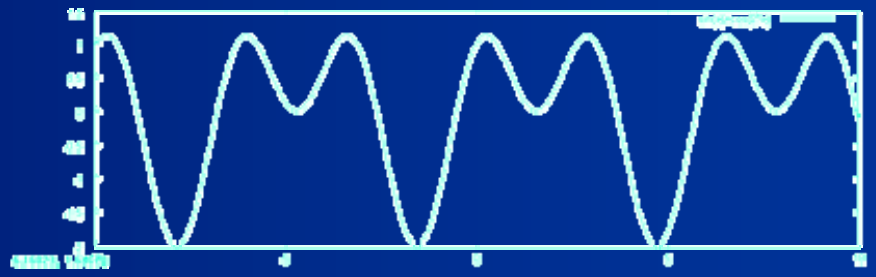
- 4 years (8 semesters).
- About 20 hours per week of lecture (20 credits).
- About 6 subjects per semesters
- ประมาณ 6 วิชา
- Total 146 credits
- Choose the major in the 2nd year

Basic Skills

- Mathematics and Geometry
- Physics
- Chemistry
- English
- Computer

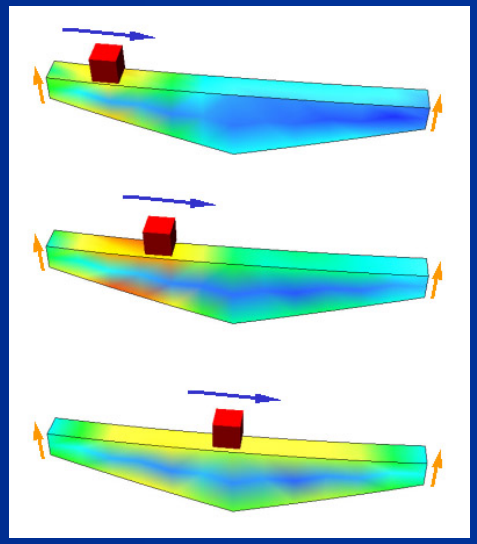
$$z_1 + \frac{p_1}{\rho g} + \frac{v_1^2}{2g} = z_2 + \frac{p_2}{\rho g} + \frac{v_2^2}{2g} + h_L$$

$$f = \frac{0.25}{\left[\log_{10}\left(\frac{\varepsilon / D}{3.7} + \frac{5.74}{Re^{0.9}}\right)\right]^2}$$



Teaching and Evaluation Method

- Lecture
- Laboratory
- Practical Training
- Project
- Quiz
- Written Exam
- Software Practice/Simulation



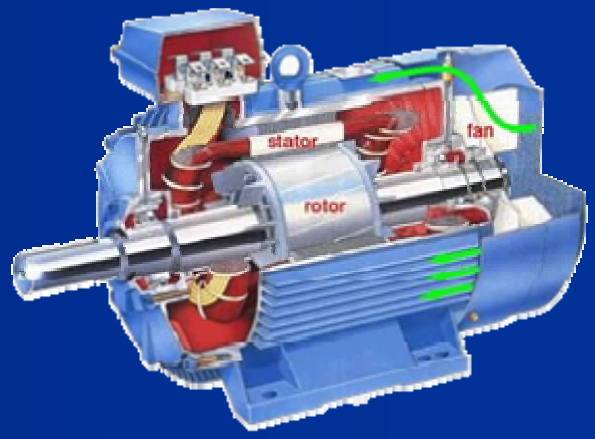
1st Year – General Basic Courses

- **Mathematics → MA111 + MA112**
  - Calculus
  - Algebra
  - Differential Equation
- **Geometry → ME100**
- **Physics → SC133, 134, 183, 184**
  - Include electricity
- **Computer → CN101**

- **English → ELXXX**
- **Material → IE121**
- **Some chemistry → SC123, SC173**

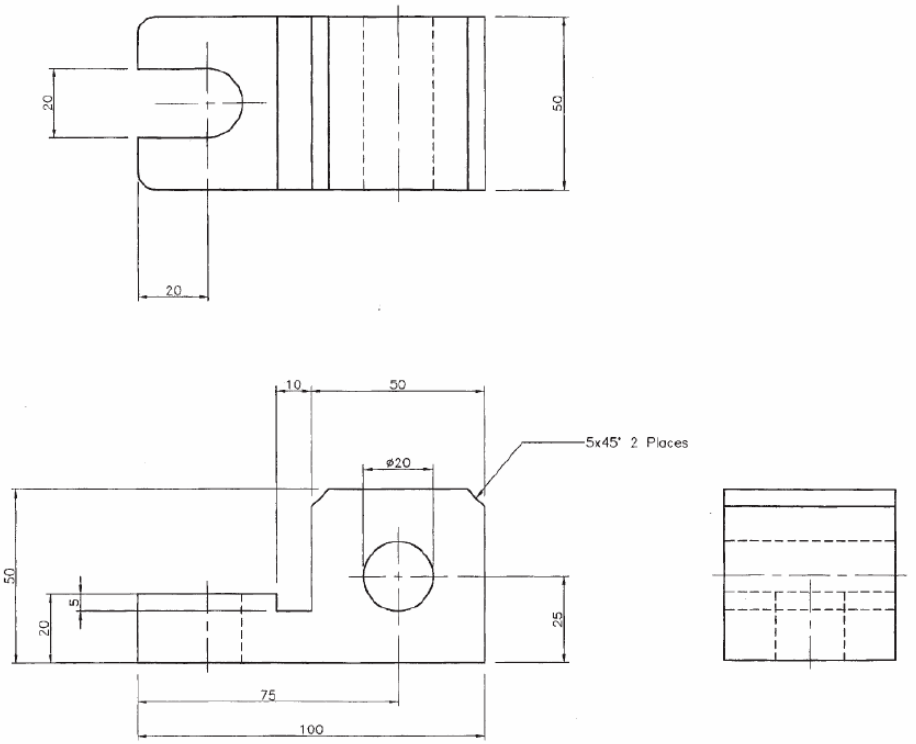
2nd Year – Engineering Basic Courses

- CE202 Statics
- ME220 Dynamics
- ME240 Fluid Mechanics
- ME200 Mechanical Drawings
- ME210 Mechanics of Solids
- ME230, 231 Thermodynamics
- IE261 Engineering Statistics
- Maths + Manufacturing and Electrcal Engineering Courses



Example an Examination - ME200

1) Create a solid model of the following object.



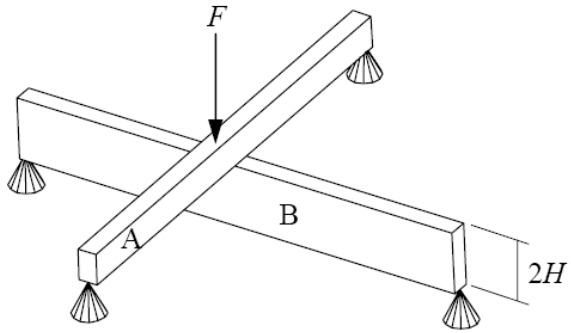
Example an Examination - ME200

1) Two simply supported beams were set up in a cross pattern as shown. Both beams have the same thickness, b and length L but with different heights.

1.1) Determine the maximum deflection.

1.2) If force F is gradually increased, which one of the beam will fail first?

Beams	Young's modulus	Area moment of inertia	Length	Height
A	E	I	L	H
B	E	$2I$	L	$2H$



hown. When

0.3

, is it safe?

n the top surface, $\sigma = g(x)$

l location.

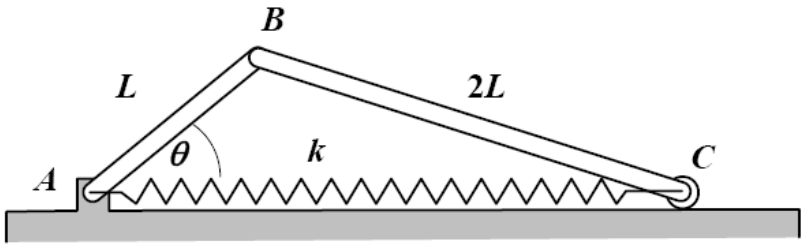
am.

H

$.5H(1+x/L)$

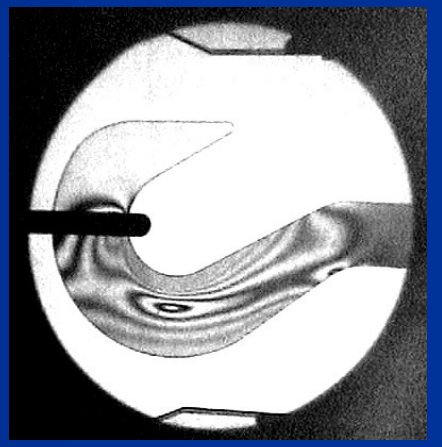
Example of Examination - ME220

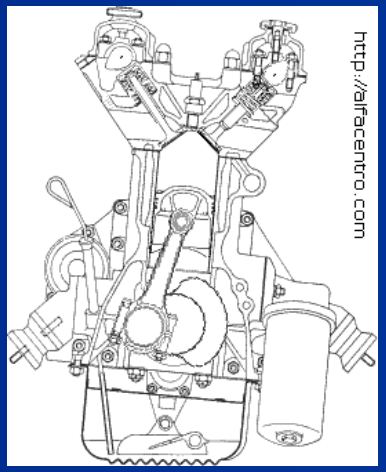
1. The two bars, ***AB*** and ***BC***, are released from rest at the position θ with spring ***AC*** at free length. Determine the angular velocity of ***AB*** at the instant it becomes horizontal. Neglect the mass of the roller at ***C***. Bar ***AB*** has a mass ***m*** and length ***L***, bar ***BC*** has a mass ***2m*** and length ***2L***. The spring has a constant ***k*** that is small enough to allow the bars to travel to the horizontal position.



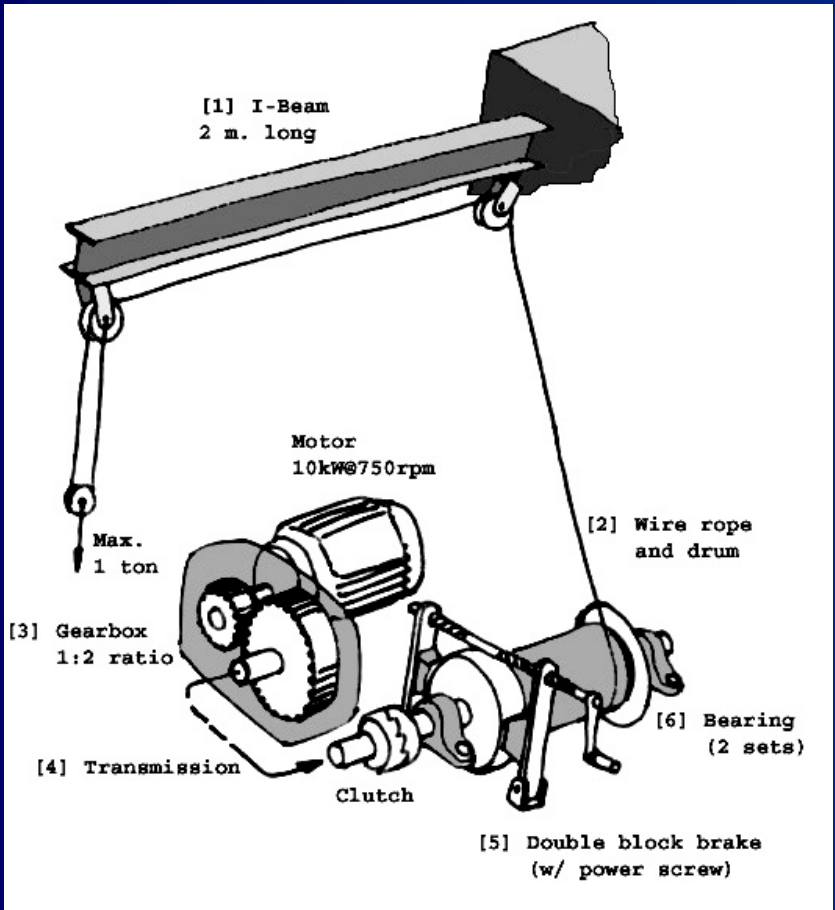
3rd Year – Mechanical Engineering Courses

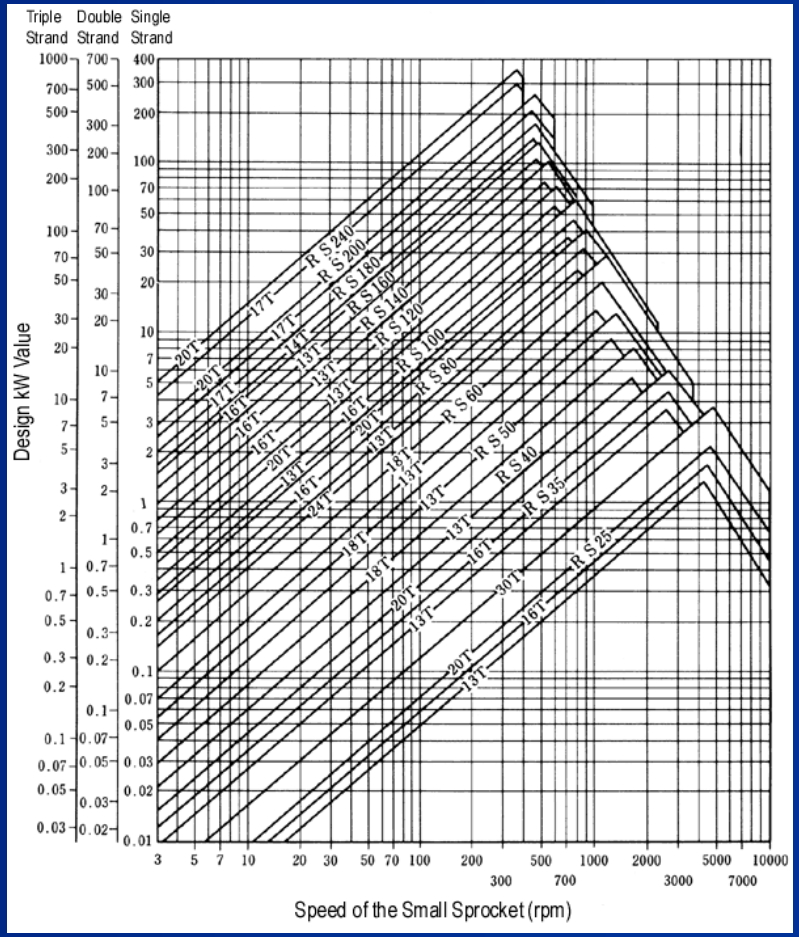
- ME300 Lab 1
- ME310, 311 Mechanical Design
- ME320 Mechanics of Machines
- ME321 Measurement and Instrumentation
- ME322 Mechanical Vibration
- ME323 Mechatronics
- ME330 Internal Combustion Engine
- ME331 Heat Transfer
- PracticalTraining





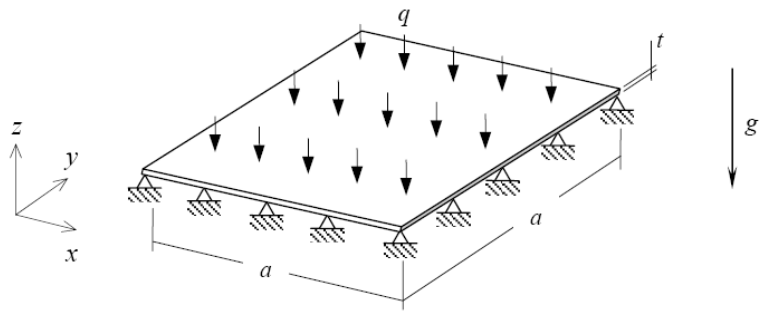
Example of Examination – ME310/311





Example of Project – ME310/311

DESIGN PROJECT 1: Optimum Reinforcement of Plate Structures



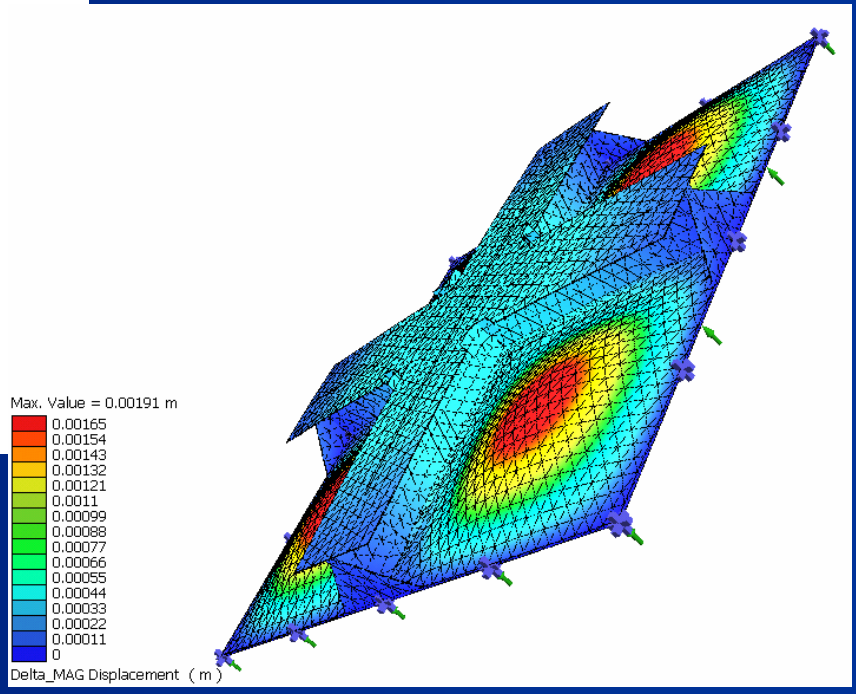
Theoretically, an a x a square plate of thickness t subjected to a uniformly distributed load q has the maximum stress at the midpoints of its edges of

$$\sigma_{max} = 0.287q\frac{a^2}{t^2}$$

and the maximum deflection,

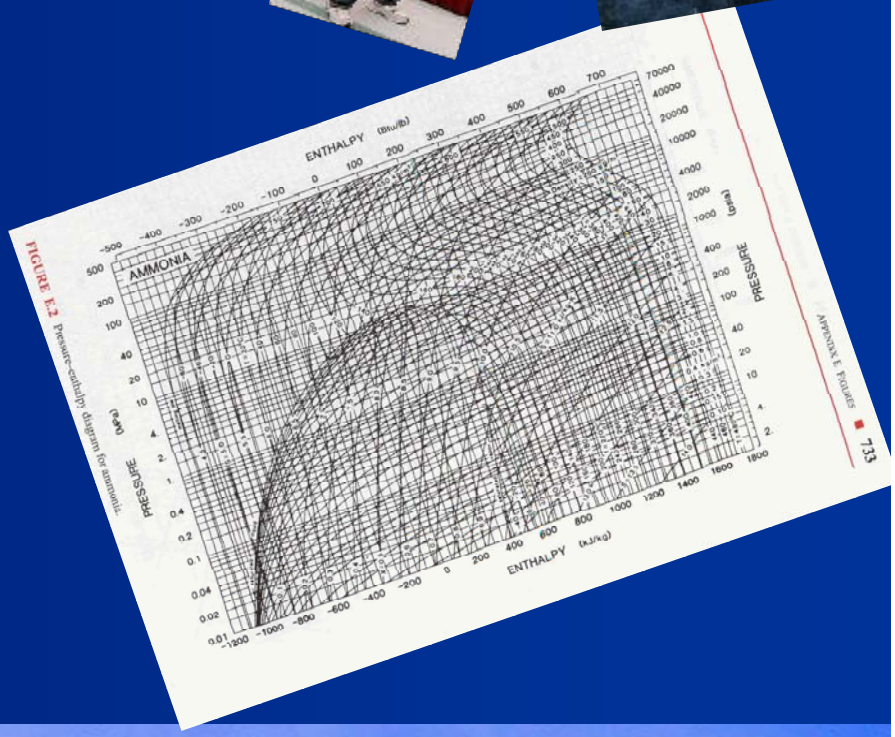
$$u_{max} = 0.00406\frac{a^4 q}{D}$$

,where $D = \frac{E}{(1-\nu^2)}\frac{I}{a}$ and $I = at^3/12$. Neglect gravity.

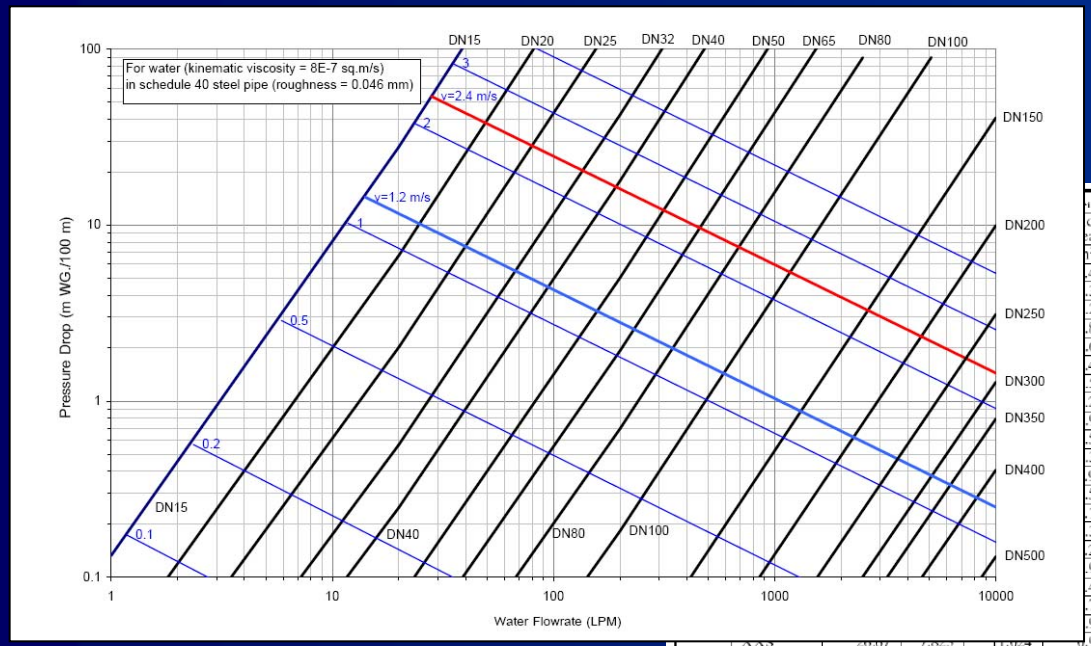


4th Year – Engineering Basic Courses

- ME400 Lab 2
- ME420 Automatic Control System
- ME430 Air Conditioning and Refrigeration
- Senior Project
- Options
  - Energy Conversion
  - Finite Element Methods
  - Engineering Piping System Design
  - Automotive Engineering
  - Special Topics
  - Etc.

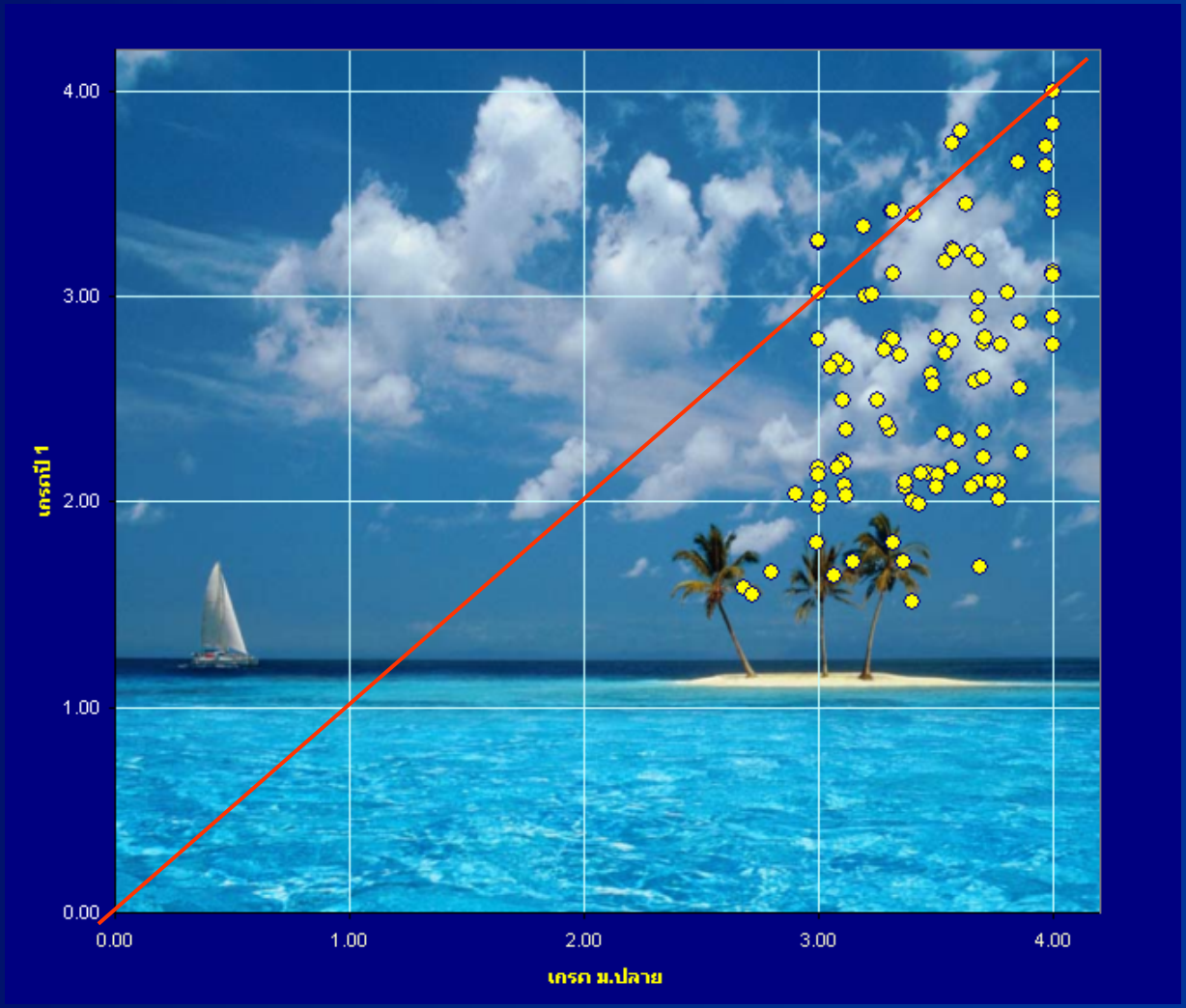


A lots of Tables and Charts



			A_m	S_o	S_i	w_p	w_w	I	z_e	R_g	z_p
de a			Metal area	Outside surf	Inside surf	Pipe wt.	Water wt.	Mom of inert	Elast sec mod	Rad of gyr	Plast sec mod
in²			cm²	m²/m	m²/m	kg/m	kg/m	cm⁴	cm³	cm	cm³
.479			0.354	0.0324	0.0245	0.277	0.048	0.037	0.072	0.323	0.103
.368			0.465	0.0324	0.0215	0.364	0.037	0.044	0.086	0.309	0.129
.235			0.598	0.0324	0.0172	0.468	0.024	0.051	0.099	0.292	0.155
.849			0.625	0.0430	0.0327	0.489	0.085	0.116	0.169	0.430	0.241
.669			0.805	0.0430	0.0290	0.630	0.067	0.137	0.200	0.413	0.298
.460			1.014	0.0430	0.0240	0.794	0.046	0.156	0.228	0.392	0.354
.505			0.804	0.0539	0.0435	0.629	0.151	0.244	0.285	0.551	0.398
.232			1.077	0.0539	0.0393	0.843	0.123	0.303	0.354	0.531	0.513
.907			1.402	0.0539	0.0338	1.098	0.091	0.359	0.418	0.506	0.633
.554			1.021	0.0670	0.0567	0.799	0.255	0.498	0.467	0.698	0.641
.302			1.273	0.0670	0.0538	0.997	0.230	0.596	0.558	0.684	0.782
.960			1.615	0.0670	0.0496	1.265	0.196	0.711	0.667	0.664	0.962
.510			2.065	0.0670	0.0436	1.617	0.151	0.836	0.783	0.636	1.174
.100			2.475	0.0670	0.0372	1.938	0.110	0.921	0.863	0.610	1.342
.322			3.254	0.0670	0.0201	2.547	0.032	1.009	0.946	0.557	1.575
.289			1.298	0.0838	0.0734	1.016	0.429	1.020	0.765	0.886	1.035
.960			1.627	0.0838	0.0705	1.273	0.396	1.236	0.927	0.872	1.275
.441			2.146	0.0838	0.0658	1.680	0.344	1.541	1.156	0.848	1.634
.790			2.797	0.0838	0.0592	2.190	0.279	1.864	1.398	0.816	2.046
.910			3.676	0.0838	0.0490	2.878	0.191	2.193	1.645	0.772	2.529
	XXS					0.954	4.632	0.0838	0.0346	3.626	0.095	2.411	1.808	0.721	2.938
25	5S		33.401	1.651	30.099	7.115	1.647	0.1049	0.0946	1.289	0.712	2.081	1.246	1.124	1.666
	10S		33.401	2.769	27.863	6.097	2.665	0.1049	0.0875	2.086	0.610	3.151	1.887	1.087	2.605
	Std	40	33.401	3.378	26.645	5.576	3.186	0.1049	0.0837	2.494	0.558	3.635	2.177	1.068	3.058
	XS	80	33.401	4.547	24.307	4.640	4.122	0.1049	0.0764	3.227	0.464	4.396	2.632	1.033	3.817
		160	33.401	6.35	20.701	3.366	5.396	0.1049	0.0650	4.225	0.337	5.208	3.119	0.982	4.732
	XXS		33.401	9.093	15.215	1.818	6.944	0.1049	0.0478	5.436	0.182	5.846	3.501	0.918	5.624
32	5S		42.164	1.651	38.862	11.862	2.101	0.1325	0.1221	1.645	1.186	4.318	2.048	1.434	2.711
	10S		42.164	2.769	36.626	10.536	3.427	0.1325	0.1151	2.683	1.054	6.681	3.169	1.396	4.305
	Std	40	42.164	3.556	35.052	9.650	4.313	0.1325	0.1101	3.377	0.965	8.104	3.844	1.371	5.316
	XS	80	42.164	4.851	32.462	8.276	5.686	0.1325	0.1020	4.452	0.828	10.063	4.773	1.330	6.792
		160	42.164	6.35	29.464	6.818	7.145	0.1325	0.0926	5.594	0.682	11.815	5.604	1.286	8.230
	XXS		42.164	9.703	22.758	4.068	9.895	0.1325	0.0715	7.747	0.407	14.198	6.734	1.198	10.529
40	5S		48.26	1.651	44.958	15.875	2.418	0.1516	0.1412	1.893	1.587	6.573	2.724	1.649	3.588
	10S		48.26	2.769	42.722	14.335	3.957	0.1516	0.1342	3.098	1.433	10.275	4.258	1.611	5.737
	Std	40	48.26	3.683	40.894	13.134	5.158	0.1516	0.1285	4.038	1.313	12.899	5.345	1.581	7.335
	XS	80	48.26	5.08	38.1	11.401	6.891	0.1516	0.1197	5.395	1.140	16.283	6.748	1.537	9.516

A Reminder on Performance of First Year Students



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Question?

Good Luck