### Related reading
- [http://ceprofs.tamu.edu/rjames/](http://ceprofs.tamu.edu/rjames/) (see this webpage for links to several codes of ethics)

### Nature of Professions
- **Types of Employment**
  - **Job** - Low skill levels
    - fast food cook
    - retail sales clerk
    - custodial worker
    - house painter
  - **Trade or vocation** - manual skills, apprenticeships, often unionized
    - beautician/barber
    - plumber/electrician/carpenter
    - truck driver/equipment operator
    - welder/machinist/iron worker
- **Self-employed (non professional)**
  - Small business owner--can have various job duties. (Note that professionals are often self-employed and have duties with professional responsibilities.)
  - Farmer/rancher

### Professionalism, cont’d.
- Knowledge or specially educated worker
  - computer programmer/network administrator
  - scientist/technician
- Professional - regulated knowledge worker
  - doctor/dentist/veterinarian/pharmacist
  - lawyer/accountant
  - engineers/architects
  - teacher (partly regulated)

### What is a professional?
- Originally... a “professor” was one who professed adherence to monastic vows of a religious order.
- Today... a person who professes to be “duly qualified” in some field by virtue of special knowledge (usually gained by specific education and verified by examination); experience; and with some state sanction or license.
Traits of a Professional

- Extensive intellectual training
- Specialized knowledge (exam)
- Skills vital to society
- Monopoly on service provided
- Autonomy
- Self-regulated
- Privilege/prestige
- Code of ethics
- Is engineering a profession?

Number of Engineers, Professions, and Knowledge Workers in the United States

<table>
<thead>
<tr>
<th>Engineers</th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical and Electronic</td>
<td>426,471</td>
<td>46,552</td>
<td>473,023</td>
</tr>
<tr>
<td>Civil</td>
<td>235,162</td>
<td>17,646</td>
<td>252,808</td>
</tr>
<tr>
<td>Mechanical</td>
<td>176,092</td>
<td>9,780</td>
<td>185,872</td>
</tr>
<tr>
<td>Industrial</td>
<td>151,859</td>
<td>24,474</td>
<td>176,333</td>
</tr>
<tr>
<td>Aerospace</td>
<td>131,786</td>
<td>11,648</td>
<td>143,434</td>
</tr>
<tr>
<td>Chemical</td>
<td>57,163</td>
<td>7,157</td>
<td>64,320</td>
</tr>
<tr>
<td>Petroleum</td>
<td>22,908</td>
<td>1,657</td>
<td>24,565</td>
</tr>
<tr>
<td>Metallurgical and Materials</td>
<td>17,021</td>
<td>2,209</td>
<td>19,230</td>
</tr>
<tr>
<td>Nuclear</td>
<td>10,108</td>
<td>693</td>
<td>10,801</td>
</tr>
<tr>
<td>Mining</td>
<td>6,063</td>
<td>415</td>
<td>6,478</td>
</tr>
<tr>
<td>Agricultural</td>
<td>2,201</td>
<td>136</td>
<td>2,338</td>
</tr>
<tr>
<td>Marine and Naval Architecture</td>
<td>12,776</td>
<td>493</td>
<td>13,269</td>
</tr>
<tr>
<td>Other</td>
<td>308,540</td>
<td>33,423</td>
<td>341,963</td>
</tr>
<tr>
<td>Total</td>
<td>1,551,961</td>
<td>156,283</td>
<td>1,708,244</td>
</tr>
</tbody>
</table>

Other professionals and knowledge workers (cont’d.)

<table>
<thead>
<tr>
<th>Other Professionals</th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lawyers</td>
<td>564,332</td>
<td>182,745</td>
<td>747,077</td>
</tr>
<tr>
<td>Physicians</td>
<td>465,468</td>
<td>121,247</td>
<td>586,715</td>
</tr>
<tr>
<td>Pharmacists</td>
<td>114,949</td>
<td>66,949</td>
<td>181,798</td>
</tr>
<tr>
<td>Architects</td>
<td>133,212</td>
<td>23,662</td>
<td>156,874</td>
</tr>
<tr>
<td>Dentist</td>
<td>135,588</td>
<td>19,941</td>
<td>155,529</td>
</tr>
<tr>
<td>Chemists</td>
<td>102,505</td>
<td>38,750</td>
<td>141,255</td>
</tr>
<tr>
<td>Biologists</td>
<td>36,207</td>
<td>25,930</td>
<td>62,137</td>
</tr>
<tr>
<td>Physicists</td>
<td>24,238</td>
<td>3,604</td>
<td>27,842</td>
</tr>
<tr>
<td>Total Employed</td>
<td>119,550,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total U.S. Population</td>
<td>248,709,873</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Models of Professionalism

- Business Model
  - professional status provides economic gain
  - monopoly provides for high pay
  - self-regulation avoids government regulation

- Social Contract Model
  - professionals are guardians of public trust
  - an implicit, unstated agreement exists between professionals and society
  - society may subsidize training of professionals

Subsidizing Engrg. Education

Cost Per Undergraduate Student Credit Hour
Texas A&M University
FY 1996-97

- Engrg. faculty salaries $117.64
- Operations costs $134.02
- In-State Tuition $34.00
- Various fees 7

Subsidy about $200/hr
Total subsidy for 130 hr engineering degree = $26,000

Implicit Agreement Between Professionals and Society

Professionals agree to:
- Provide service
  - for public well-being
  - promote public welfare
  - even at own expense
- Self-regulation
  - enforce competence
  - enforce ethical standards
Implicit Agreement Between Professionals and Society, Cont'd...

Society agrees to:
- Allow certain autonomy
- Freedom of self-regulation
- Freedom to choose clients
- Social status
- Respect from society
- Titles
- Provide attractive compensation
- Reward for service
- Attract competent people

Social Roles
- Professional
- Parent
- Child
- Citizen
- Member of religious organization
- Member of civic organization
- E.G., Rotary club

Social Roles
- Professional
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- Child
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Professional Ethics vs. Personal Ethics
- There is overlap between professional and personal ethics.
- Professional ethics may be more restrictive than personal ethics.
- Ban on advertising
- Professionally bound not to reveal confidential information
- Personal ethics may be more restrictive than professional ethics
- Drinking

Professional Ethics vs. Personal Ethics
- Professional Ethics
- Personal Ethics

Functions of professional codes of ethics
- Recognize professionals’ responsibilities
- Create ethical environment
- Guide in specific circumstances
- Education tool
- Indicate profession is dedicated to ethical behavior

“Interaction Rules”
Increasingly severe consequences

Why Support the Codes?
- Condition of membership in NSPE, IEEE, ASME, etc.
- Framework for proper behavior
- Responsibilities of engineers are articulated
- Increase responsibility of engineering profession
- Implicit contract with society—self regulation
- Gives weight to ethical positions
- “As an engineer, my code prevents me from…”
- “As an engineer, my code requires me to….”

LIMITATIONS OF CODES
- Not a “recipe” for decisions
- Cannot substitute for judgement

General content of codes:

<table>
<thead>
<tr>
<th>NSPE</th>
<th>AICHE</th>
<th>IEEE</th>
<th>ASCE</th>
<th>ASME</th>
<th>ABET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uphold public welfare</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Faithful to employer &amp; clients</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Maintain integrity</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Practice only in areas of competence</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Objective and truthful</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Work with dignity &amp; integrity</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Honor</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Promote and develop profession</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Accept responsibility</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Acknowledge contributions of others</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Recruit</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Adequate compensation</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Public service</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Environment</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Do not discriminate by race, gender, etc.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Strike &amp; picket lines</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
Case 1: A hazardous waste company is planning to locate a new incinerator in Dinkey town. The combustion efficiency is 99.9999% which is very good, but 10 pounds of toxins will be emitted into Dinkey town each year. Epidemiological studies indicate that the risk is small (one extra death every 100 years). The local newspaper is doing an article on the new incinerator and decides to interview you. To avoid public alarm, your boss asks you to say the incinerator is “completely safe”. According to the code, should you make this statement?

Case 2: Your company is preparing a proposal for a $100 million construction contract. To make your company seem more “professional”, your boss asks you to indicate the company has 30 engineers on staff. In actuality, the staff has 10 engineers and 20 draftsmen. When you challenge your boss, he argues that the draftsmen have many years of experience and are often able to make engineering decisions. According to the codes, what should you put in the proposal?

Case 3: Mary is preparing a big presentation to the president of Ford about the next generation of sport utility vehicles. She holds a staff meeting to solicit creative input for the presentation. Fred suggests that the vehicles should have a tunable suspension system, soft for highway driving and hard for off-road travel. At the presentation, Mary describes Fred’s idea, which is enthusiastically accepted by the president. Should Mary credit Fred with the idea?

Case 4: Your company makes beer bottles. To save money, your boss asks you if you can design a new bottle that weighs 5% less. After many design iterations, you accomplish the goal. However, testing shows that the new bottles have a 0.0001% greater chance of shattering, which could result in injuries to consumers. Should you recommend that these new bottles be used?

Case 5: As a designer of bridges, you have years of experience working with traditional materials (e.g., steel, concrete). You have been very successful and have risen to the role of “chief bridge engineer”. Your staff just designed a new bridge using composite materials composed of epoxy and graphite fibers. Although you have no experience with these materials, they ask you to sign off on the plans because you are the chief engineer. According to the codes, should you sign off on the plans?

Case 6: Your employer is the largest construction company in the city. You are elected to the city’s Board of Governors. Among your duties as a member of this board is to award construction contracts. Your employer submits a bid for a $10 million project involving the widening of a major road in the city. According to the code, should you be involved with the decision to select a contractor for this project?
Case
You are a member of an engineering team that designs pressure vessels for chemical plants. During a one-on-one meeting with your boss, she notices that the wrong grade of steel was specified which could have resulted in a ruptured vessel. According to the codes, should you admit your mistake or blame it on one of your team members?

Case
Your job as an engineer is to specify tires for the new-model Taurus. Three companies are being considered for the contract to supply tires. You test them thoroughly on the test track. One salesman suggests that you could get to know their product much better if you drove on his company's tires every day. He offers to put new tires made by his company on your car. According to the code, should you accept the offer?

Case
You are the lead engineer of an engineering design team. The technical societies offer continuing education courses that allow engineers to keep up to date on the latest technical developments. A course costs $1000 and requires one week to complete. A member of your design team asks for approval to take the continuing education course. According to the codes, is it reasonable for you to approve this expense?

Case
A hair salon wants to run a TV ad indicating that they can take even the biggest geek and make him attractive. You are a client of the salon, and they know you are an engineer. They ask you to star in their commercial as “the geek” for which you will receive $12,500. They want you to wear a big pocket protector, heavy-rimmed glasses, buckteeth, and high-riding pants. They will show you in this awful state as the “before” client. As the “after” client, you will be transformed into a stud. As part of the commercial, they want you to state that you are a real-life engineer and profess how they saved you from geek-dom. According to the codes, should you perform in this ad?

Case
John works for an engineering consulting firm. In the course of his engineering activities, John is privy to his clients' proprietary information. While working for Company A, he determines that Company B's proprietary information can solve Company A's problem. According to the codes, should he reveal Company B's proprietary information to Company A?

Assignment
Read Case 33 “Parkville” (pp 326 in ed. 2) and the ASCE Code of Ethics (on CD).
A) Identify and discuss one way in which ASCE member Dorsey’s code of ethics might help her handle the issues she is faced with. (1 paragraph)
Assignment, cont’d...

B) Suppose that CDC gains approval to proceed with design of the new development, and another engineer, Joe Wilson, P.E., is hired to design the new facility. Discuss his responsibilities, particularly with respect to ASCE guideline 1.f. (1 page max)