Draft

"Beginning Engineering Course Plan"

By

Max Smith

The Beginning Engineering is designed to give students an understanding of the breadth of engineering fields and the respective specialties. The course is intended for the senior high school year. It will meet daily for one semester hour, but will include field trips and guest speakers. The course begins with an introduction and evaluations relative to University admission requirements followed by the Engineering and Project Management methodologies. Students will select a course project that will be reported at the end of the course. There are about 127 Engineering Specialties and these will be divided so that each student will have about the same number to be analyzed and reported per a prescribed format during the units on the respective disciplines. The Units on the Engineering Disciplines will be supported with guest speakers and field trips. There will be a one week unit on engineering economics, and a three week wrap-up make the Project Presentations and to consolidate the learnings of the previous units.

Course Units:

Unit 0, An introduction to the course will lead off with description of the course and its expected outcome and an evaluation of the student's command of the Common Core requirements for the Engineering Career Pathway. This will include the essential components of math, chemistry, physics, and biology appropriate for entrance to a University at the freshman level. The evaluation will be done via a typical entrance examination for a University School of Engineering.

Unit 1 will cover the Engineering Process that covers the steps from the conception of a problem or issue that requires a solution to sell-off of a production prototype.

Unit 2 on Project Management to effectively address two issues. The first is to satisfy the California Career Technical Education Model Curriculum Standards (excerpt attached) and the other is to apply the methodology that is commonly used in industry for developing a solution to an engineering problem/issue, and manage a project by a process that is endorsed by the Project Management Institute (PMI).

Students will be required to select an engineering problem/issue from one of the Engineering Fields for which they are interested. They will go through the engineering process to arrive a prototype solution and provide an associated Project Plan. The students will define at least the scope, schedule, costs, and risks related to the project and present the results in Unit 10.

Unit 3 will be based on MIT Engineering Economy course work developed by MIT. Engineering Economics will cover compound interest, internal rate of return, and similar concepts that are necessarily associated with engineering endeavors.

The Field of Engineering is comprised of six major disciplines that give rise to over 130 specialties:

1. Chemical Engineering
2. Civil Engineering
3. Electrical Engineering

4. Mechanical Engineering
5. Systems Engineering
6. Interdisciplinary Engineering

The breakdown of the disciplines and specialties may be found at Engineering Disciplines.

The Units 4 through 9 for the six disciplines will tend to follow a common format:
Introduction

- Assign Engineering Specialties to the students. They will be required to research the assigned specialty and present a 15 minute report to the class on their findings in a prescribed format.
- Guest Speakers related to the discipline
- Field trips

Unit 10 'Wrap up', will be a review of the course to include presentations of the major projects (3) and a review of the Universities that are top ranked for particular disciplines, job opportunities, and salaries.

Course Schedule:

Unit #	0	1	2	3	4	5	6	7	8	9	10
Unit	Intro & Eval STEM	Engr Process	Project mgmt Process	Engr Econmy	Chem	Civil	Elec	Mech	Systems	Inter Discip	Wrap-up & Project presentations
Weeks	2	3	3	1	4	4	4	4	4	4	3

Grading:

This is not a course where the student can fail. If a student cannot keep up or decides that Engineering is not a chosen career choice they may drop the course with a "C" grade. However, it is important for the student to see a track record of accomplishment.

The students will be assigned an Engineering Specialties. They will be required to research and report on the specialty according to a prescribed format. Completion for each of the assignments will accrue 10 points.

The students will be required to prepare and submit a one page report on each guest speaker and field trip. Each of these will accrue 5 points.

The students will submit a report in Unit 10 on their chosen Engineering Solution. Each of these will be worth 25 points.

Accumulated points for each student will be posted and indicate class ranking.

Facilities:

- Classroom, with seating appropriate for the number of students
- Intel based computers with Microsoft Office suite including MS Project

- Computer projection equipment
- White Board

Appendix – Engineering Disciplines

Discipline	Sub-discipline	Major Specialties
1 Chemical Engineering	Biomolecular engineering	
	Materials engineering	Metallurgical engineering
		Ceramic engineering
		Polymer engineering
		Crystal engineering
	Molecular engineering	
	Process engineering	Petroleum refinery engineering
		Plastics engineering
		Paper engineering
		Textile engineering
Civil engineering	Environmental engineering	Ecological engineering
		Fire protection engineering
		Sanitary engineering
		Municipal or urban engineering
	Geotechnical engineering	Mining engineering
		Foundation (engineering)
	Structural engineering	Earthquake engineering
		Wind engineering
		Architectural engineering
		Ocean engineering
	Transport engineering	Traffic engineering
		Highway engineering
		Railway systems engineering
	Water resources engineering	Hydraulic engineering
		River engineering
		Coastal engineering
		Groundwater engineering
Electrical engineering	Computer engineering	Software engineering
		Hardware engineering
		Network engineering

	Electronic engineering	Control engineering
		Telecommunications engineering
	Optical engineering	
	Power engineering	
Mechanical engineering	Acoustical engineering	
	Manufacturing engineering	
	Thermal engineering	
	Vehicle engineering	Automotive engineering
		Naval architecture
		Aerospace engineering
Systems engineering	An interdisciplinary field of engineering that focuses on how to design and manage complex engineering projects over their life cycles. Issues such as reliability, logistics, coordination of different teams (requirements management), evaluation measurements, and other disciplines become more difficult when dealing with large or complex projects. Systems engineering deals with work-processes, optimization methods, and risk management tools in such projects. It overlaps technical and human-centered disciplines such as control engineering, industrial engineering, organizational studies, and project management. Systems engineering ensures that all likely aspects of a project or system are considered, and integrated into a whole	
Interdisciplinary	Aerospace engineering	Aeronautics
		Astronautics
	Agricultural engineering	Aquaculture engineering
		Biological Engineering
		Biomechanical engineering
		Bioprocess engineering
		Ecological engineering
		Energy engineering
		Environmental engineering
		Food engineering
		Forest engineering
		Health and Safety engineering
		Natural Resources engineering
		Machinery Systems engineering
		Pharmaceutical engineering
		Information & Electrical Systems Engineering
	Applied engineering	Automation and Control Engineering
		CADD

	The field concerned with the application of management, design, and technical skills for the design and integration of systems, the execution of new product designs, the improvement of manufacturing processes, and the management and direction of physical and/or technical functions of a firm or organization. Applied engineering degreed programs typically include instruction in basic engineering principles, project management, industrial processes, systems integration and control, quality control, and statistics.[2]	Construction
		Electronics
		Graphics
	Biological engineering	Agricultural engineering
		Biochemical engineering
		Biosystems engineering
		Biomedical engineering
		Biotechnical engineering
		Biomechanical engineering
		Biomolecular engineering
		Bioresource engineering
		Bioprocess engineering
		Genetic engineering
		Health and Safety engineering
		Pharmaceutical engineering
		Protein engineering
		Tissue engineering
		Safety engineering
		Systems Biology
		Synthetic Biology
	Building services engineering	Mechanical engineering
		Electrical engineering
		escalators,
		Fire protection engineering
		Natural lighting
	Mechatronics	Robotics
		Instrumentation engineering

		Avionics
	Military engineering	Combat Engineering
		Strategic Sipport
		Ancillary Support
	Nanoengineering	Molecular engineering
		Materials science
		Instrumentation engineering
		Electronics
	Nuclear engineering	Medical Physics
		Nuclear fuel
		Radiation Protection
		Power Plants
	Petroleum engineering	Reservoir engineering
		Drilling engineering
		Production engineering