

**APTECH 90B Course Outline as of Fall 1992****CATALOG INFORMATION**

Dept and Nbr: APTECH 90B Title: QUANT REASON/APTECH

Full Title: Quantitative Reasoning in Applied Technology

Last Reviewed: 10/17/2011

Units		Course Hours per Week		Nbr of Weeks	Course Hours Total	
Maximum	3.00	Lecture Scheduled	3.00	17.5	Lecture Scheduled	52.50
Minimum	3.00	Lab Scheduled	0	6	Lab Scheduled	0
		Contact DHR	0		Contact DHR	0
		Contact Total	3.00		Contact Total	52.50
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 105.00

Total Student Learning Hours: 157.50

Title 5 Category: AA Degree Applicable

Grading: Grade or P/NP

Repeatability: 00 - Two Repeats if Grade was D, F, NC, or NP

Also Listed As:

Formerly: CET 90B

**Catalog Description:**

A course in quantitative reasoning which applies trigonometry principles to problems encountered in surveying, civil engineering, construction, electronics and related engineering technologies. The areas of study are the analysis, solution and application of angle measurements and their related functions, associated graphical representations, solution to triangles, complex numbers and analytic geometry, as they are related to the trades and various technologies.

**Prerequisites/Corequisites:**

Course Completion of APTECH 90A ( or CET 90A) OR Completion of MATH 155 or higher (V1) OR Completion of MATH 155 or higher (V2)

**Recommended Preparation:****Limits on Enrollment:****Schedule of Classes Information:**

Description: A course in quantitative reasoning which applies trigonometry principles encountered in surveying, civil engineering, construction, electronics and related engineering technologies. (Grade or P/NP)

Prerequisites/Corequisites: Course Completion of APTECH 90A ( or CET 90A) OR Completion of MATH 155 or higher (V1) OR Completion of MATH 155 or higher (V2)

Recommended:

Limits on Enrollment:

Transfer Credit: CSU;

Repeatability: Two Repeats if Grade was D, F, NC, or NP

## **ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:**

<b>AS Degree:</b>	<b>Area</b>		<b>Effective:</b>	<b>Inactive:</b>
	B	Communication and Analytical Thinking	Fall 2009	Spring 2016
	B	Communication and Analytical Thinking	Fall 1981	Fall 2009
<b>CSU GE:</b>	MC	Math Competency		
	<b>Transfer Area</b>		<b>Effective:</b>	<b>Inactive:</b>
	B4	Math/Quantitative Reasoning	Fall 1991	Fall 1997
<b>IGETC:</b>	<b>Transfer Area</b>		<b>Effective:</b>	<b>Inactive:</b>
<b>CSU Transfer:</b>	Transferable	<b>Effective:</b>	Spring 1982	<b>Inactive:</b>
				Spring 2016
<b>UC Transfer:</b>		<b>Effective:</b>		<b>Inactive:</b>

**CID:**

**Certificate/Major Applicable:**

Certificate Applicable Course

## **COURSE CONTENT**

### **Outcomes and Objectives:**

The student will be able to demonstrate their knowledge of the theories, concepts and skills used in quantitative reasoning which applies goniometric principles to solve selected problems encountered in surveying, civil engineering, construction, electronics and related engineering technologies. For example the student will be able to:

1. State the purpose, function, and application of trigonometry including definitions, characteristics of functions, radian and degree measurements, and inverse functions.
2. Demonstrate and apply Pythagorean's theorem to the laying out of a right triangle with a tape.
3. Demonstrate and apply trigonometry to solve right triangles including applications to the construction trades with the determination of the slopes of roofs and various member roof cuts.
4. Demonstrate and apply trigonometry to solve right triangles including applications to the construction trades with the determination of the angles found in rafters, studs, and bracing.
5. Demonstrate and apply trigonometry to solve right triangles including applications to the construction trades with the determination of the lengths of rafters.
6. Demonstrate and apply trigonometry to solve right triangles including

applications to the construction trades with the determination of the angles and lengths of members in trusses.

7. Demonstrate and apply trigonometry to solve right triangles including applications to the construction and surveying trades with the determination of the grades of roads and railroads, general slope measurements, and horizontal measurements taken on slopes.

8. Demonstrate and apply trigonometric concepts of oblique triangles to triangle solutions including right triangles and oblique triangles, that are utilized in the construction and civil engineering technologies.

9. Demonstrate and apply the trigonometric concepts of oblique triangles to the Law of Sines and the Law of Cosines, that are utilized in the construction and civil engineering technologies.

10. Demonstrate and apply the trigonometric concepts of oblique triangles as found in the construction trades with the determination of angles and lengths of members in trusses containing oblique triangles.

11. Demonstrate and apply the trigonometric concepts of oblique triangles as found in the construction trades with the determination of lengths of sides in triangular lots.

12. Demonstrate and apply the trigonometric concepts of oblique triangles as found in the construction trades as with the applications of vector additions involving three vectors forming oblique triangle, as well as the application of vector sums, angles and magnitude of force, displacement and velocity vectors.

13. Demonstrate and apply the trigonometric concepts of oblique triangles as found in the construction trades as with the applications of vector addition involving three vectors forming an oblique triangle, such as found in the application of determining the static equilibrium of cables, beams and trusses.

14. Demonstrate and apply the trigonometric concepts of components of vectors and vector addition found in the construction trades as with the applications of horizontal and vertical components of forces.

15. Demonstrate and apply the trigonometric concepts of components of vectors and vector addition found in the construction trades as with the applications of N-S and E-W components of displacements and velocities.

16. Demonstrate and apply the trigonometric concepts of components of vectors and vector addition found in the construction trades as with the addition of two perpendicular forces, displacements and velocities.

17. Demonstrate and apply the trigonometric concepts of components of vectors and vector addition found in the construction trades as with the applications of vector addition and subtraction involving more than three vectors such that would be found in the application of determining vector sums, angles and magnitude of force, displacement and velocity vectors.

18. Demonstrate and apply the trigonometric concepts of components of vectors and vector addition found in the construction trades as with the applications in determining the static equilibrium of cables, beams and trusses.

19. Demonstrate and apply the techniques of analytic geometry with regard to arc lengths and areas found in the construction trades as shown with the determination of the arc length and area of sectors.

20. Demonstrate and apply the techniques of analytic geometry with regard to arc lengths and areas found in the construction trades as shown with the determination of the lengths of highway curves and land areas within

highway curves.

21. Demonstrate and apply the techniques used in the graphing of trigonometric functions as found in the construction, electrical and electronic technology trades as shown with the determination of amplitude, periodic functions, resonance, graphs of trigonometric functions, general graphing and graphing by the addition of ordinates.

### **Topics and Scope:**

Theories, concepts and skills used in quantitative reasoning which applies goniometric principles to solve selected problems encountered in surveying, civil engineering, construction, electronics and related engineering technologies. For example the topics covered include:

1. Application of Trigonometric Functions
  - a. application of definitions for surveying
  - b. characteristics of functions used
  - c. applications of radian and degree measurements to triangular lots
  - d. applications to right triangles as found in construction applications
  - e. application to the length and areas of sectors (i.e. streets and highway curves)
2. Application involving Oblique Triangles
  - a. applications of trigonometric functions to similar triangles
  - b. application of oblique triangles
  - c. determination of the area of triangles
  - d. applications of the Law of Sines
  - e. applications of the Law of Cosines
  - f. ambiguous triangles and associated errors in judgment
3. Components of Vectors and Vector Addition
  - a. definition of vectors
  - b. addition and subtraction of vectors
  - c. complex numbers
  - d. polar coordinates
4. Applications of Arc Lengths and Areas
  - a. application to the length and areas of sectors (i.e. streets and highway curves)
  - b. applications of analytic geometry
  - c. applications to irregularly shaped lots
5. Application of Sine and Cosine Graphs
  - a. general graphing of functions and graphing by the addition of coordinates
  - b. analysis of amplitude
  - c. analysis of periodic function
  - d. analysis of resonance

### **Assignment:**

Application of concepts and problem solving in the following areas:

1. Introduction of Trigonometry (definitions, characteristics of functions, radian and degree measure, inverse functions, arc length and area of a sector). Applications include solving problems such as: laying out right angles using tape measure; determining slope of

- roofs and angles of rafters; determining the length of truss members.
2. Graphing Trigonometric Functions (amplitude, periodic function, resonance, graphs of fundamental trigonometric functions, general graphing and graphing by addition of ordinates). Applications include solving problems such as: determining the relationships found in inductive and capacitive circuits; interpreting Lissajous figures; determining structural dampening effects through the addition of sine and cosine waves.
  3. Identities and Conditional Equations (fundamental identities, reciprocal identities, quotient identities, sign identities, pythagorean identities, proof, sum, and difference of angles and related identities, trigonometric equations and their solutions). Applications include solving problems such as: determining the sum and difference of two angles in electronic circuit theory and wave mechanics; determining harmonic dampening applied to structures; determining power in AC circuit by using electric power law.
  4. Triangle Solutions (right triangles, oblique triangles, Law of Sine, Law of Cosine, area of triangles, numerical solutions by use of calculators). Applications include solving problems such as: determining length of truss members with oblique angles; using survey techniques to determine property line lengths; determining vector sums, angles, and magnitude of force for problems encountered in construction and structures.
  5. Complex Numbers and Polar Coordinates (definitions, arithmetic of complex numbers, graphical representation, powers of complex numbers, polar form of curves, definitions of vectors, addition and subtraction of vectors). Applications include solving problems such as: determining sum of two perpendicular forces, and the addition or subtraction of vectors applied to construction problems; determining displacements and velocities; determining horizontal and vertical force components; determining N-S and E-W survey components.
  6. Analytic Geometry (applications of analytic geometry). Applications include solving problems such as: determining arc length and sector areas used in calculating highway curves and land areas within highway curves; determining the area of irregularly shaped lots.

### Methods of Evaluation/Basis of Grade:

**Writing:** Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

None, This is a degree applicable course but assessment tools based on writing are not included because problem solving assessments and skill demonstrations are more appropriate for this course.

Writing  
0 - 0%

**Problem Solving:** Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

Homework problems	Problem solving 10 - 50%
<b>Skill Demonstrations:</b> All skill-based and physical demonstrations used for assessment purposes including skill performance exams.	
Performance exams	Skill Demonstrations 25 - 50%
<b>Exams:</b> All forms of formal testing, other than skill performance exams.	
QUIZZES AND TECHNICAL PROBLEMS TO SOLVE	Exams 10 - 40%
<b>Other:</b> Includes any assessment tools that do not logically fit into the above categories.	
ATTENDANCE AND CLASS PARTICIPATION	Other Category 0 - 10%

**Representative Textbooks and Materials:**

Fundamentals of Technical Mathematics, Arthus D Kramer: Glencoe/McGraw-Hill, 1992

Applied Trigonometry, McHale and Witzke: Addison-Wesley, 1985