# ITT Technical Institute

# GS1140

# Problem Solving Theory

# Onsite and Online Course

# SYLLABUS

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**Credit hours:** 4.5

**Contact/Instructional hours:** 45 (45 Theory Hours)

**Prerequisite(s) and/or Corequisite(s):**

None.

**Course Description:**

This course introduces students to fundamental principles, strategies and methods of problem solving theory.

# COURSE SUMMARY

## COURSE DESCRIPTION

This course introduces students to fundamental principles, strategies and methods of problem solving theory.

## MAJOR INSTRUCTIONAL AREAS

1. Principles of critical reading, analytical thinking, and mathematical reasoning
2. The general problem solving process
3. Problem solving theory and tools

## COURSE LEARNING OBJECTIVES

By the end of this course, you should be able to:

1. Explain the importance of identifying the correct problem in a situation.
2. Gather the relevant information regarding a problem situation by using critical analysis of information and interviewing.
3. Identify the correct problem in a given scenario by using various problem definition techniques.
4. Apply idea generation techniques to generate possible solutions for a given problem.
5. Decide the course of action to solve a given problem by employing Kepner-Tregoe strategies.
6. Formulate a plan to implement a solution for a given problem using a methodical approach.
7. Evaluate the effectiveness of a solution by applying standard guidelines, checklists, and considerations.
8. Apply mathematical tools to solve problems.

# COURSE OUTLINE

## MODULE 1: ORGANIZED APPROACH TO PROBLEM SOLVING

### COURSE LEARNING OBJECTIVES COVERED

1. Explain the importance of identifying the correct problem in a situation.

### TOPICS COVERED

- Real Versus Perceived Problem
- Need for a Structured Approach to Problem Solving
- Five-Step Problem Solving Heuristic

| MODULE LEARNING ACTIVITIES | GRADED | OUT-OF-CLASS TIME |
|---|---|---|
| **Reading:** *Strategies for Creative Problem Solving (Custom ed.),* Chapter 1, pp. 1-11. | No | 0.75 hrs. |
| **Lesson:** Study the lesson for this module. | No | 1 hr. |
| **Discussion:** Participate in the discussion titled "My Choice for a Problem Solver." | Yes | 1 hr. |
| **Analysis:** Submit the assessment titled "Identifying the Real Problem." | Yes | 2 hrs. |
| **Project:** Review the project requirements and Complete Task 1. | No | 2 hrs. |

Total Out-Of-Class Activities: 6.75 Hours

## MODULE 2: DEFINING THE REAL PROBLEM

### COURSE LEARNING OBJECTIVES COVERED

1. Explain the importance of identifying the correct problem in a situation.
2. Gather the relevant information regarding a problem situation by using critical analysis of information and interviewing.
3. Identify the correct problem in a given scenario by using various problem definition techniques.
8. Apply mathematical tools to solve problems.

### TOPICS COVERED

- The Process of Gathering Information About a Problem
- Problem Definition Techniques
- Classification of Numbers
- Basic Mathematical Operations of Numbers
- Fractions
- Basic Algebra: Addition and Subtraction of Algebraic Expressions

| MODULE LEARNING ACTIVITIES | GRADED | OUT-OF-CLASS TIME |
|---|---|---|
| **Reading:** *Strategies for Creative Problem Solving (Custom ed.),* Chapter 3, pp. 37–44 and Chapter 4, pp. 47–72. | No | 2 hrs. |
| **Reading:** "Order of Operations" and "Applications and Problem Solving (General)" Concept Videos: http://media.pearsoncmg.com/pcp/pls_1256161381/ | No | 0.5 hrs. |
| **Reading:** ITT Tech Virtual Library > School of Study > General Education Information > Recommended Links > Mathematics > Interactive Mathematics > Algebra > Numbers > Integers, Number Properties, Order of Operations | No | 1 hr. |
| **Reading:** ITT Tech Virtual Library > School of Study > General Education Information > Recommended Links > Mathematics > Interactive Mathematics > Algebra > Basic Algebra > Addition and Subtraction of Algebraic Expressions, Solving Equations | No | 2 hrs. |

| MODULE LEARNING ACTIVITIES | GRADED | OUT-OF-CLASS TIME |
|---|---|---|
| **Reading:** ITT Tech Virtual Library > School of Study > General Education Information > Recommended Links > Mathematics > Practical Algebra Lessons from Purplemath > Preliminary Topics > Number Properties, Number Types, Fractions | No | 4 hrs. |
| **Lesson:** Study the lesson for this module. | No | 2 hrs. |
| **Short Answer:** Submit the assessment titled "Gathering Information." | Yes | 1.5 hrs. |
| **Analysis:** Submit the assessment titled "Carrying Out a K.T. Problem Analysis." | Yes | 3.5 hrs. |
| **Exercise:** Submit the exercise titled "Mathematical Operations of Numbers and Simplifying Algebraic Expressions." | Yes | 2.5 hrs. |
| **Project:** Complete Task 2 of the project. | No | 1 hr. |

Total Out-Of-Class Activities: 20 Hours

## MODULE 3: GENERATING SOLUTIONS

### COURSE LEARNING OBJECTIVES COVERED

4. Apply idea generation techniques to generate possible solutions for a given problem.
8. Apply mathematical tools to solve problems.

### TOPICS COVERED

- Types of Mental Blocks
- Blockbusting: Goman's Blockbusters
- Improvement of Creative Abilities
- Techniques to Generate Ideas
- Basic Algebra: Multiplication and Division of Algebraic Expressions
- Exponents and Their Properties
- Distance, Rate, and Time Calculations
- Complex Numbers

| MODULE LEARNING ACTIVITIES | GRADED | OUT-OF-CLASS TIME |
|---|---|---|
| **Reading:** *Strategies for Creative Problem Solving (Custom ed.):* Chapter 2, pp. 13–32, Chapter 5, pp. 89–106, Chapter 6, pp. 111–134. | No | 2.5 hrs. |
| **Reading:** "Percents" Concept Video: http://media.pearsoncmg.com/pcp/pls_1256161381/ | No | 0.25 hrs. |
| **Reading:** ITT Tech Virtual Library > School of Study > General Education Information > Recommended Links > Mathematics > Interactive Mathematics > Algebra > Basic Algebra > Multiplication of Algebraic Expressions, Division of Algebraic Expressions | No | 1 hr. |
| **Reading:** ITT Tech Virtual Library > School of Study > General Education Information > Recommended Links > Mathematics > Interactive Mathematics > Imaginary > Complex Numbers > Basic Definitions | No | 1 hr. |
| **Reading:** ITT Tech Virtual Library > School of Study > General Education Information > Recommended Links > Mathematics > Interactive Mathematics > Algebra > Exponents & Radicals > | No | 2 hrs. |

| MODULE LEARNING ACTIVITIES | GRADED | OUT-OF-CLASS TIME |
|---|---|---|
| Simplifying Expressions with Integral Exponents | | |
| **Reading:** ITT Tech Virtual Library > School of Study > General Education Information > Recommended Links > Mathematics > Math.com > Pre-Algebra > Ratios and Proportions > Distance, rates, and time | No | 1.5 hrs. |
| **Lesson:** Study the lesson for this module. | No | 2 hrs. |
| **Discussion:** Participate in the discussion titled "Assessing Creativity." | Yes | 1 hr. |
| **Short Answer:** Submit the assessment titled "Recognizing and Addressing Mental Blocks." | Yes | 1.5 hrs. |
| **Analysis:** Submit the assessment titled "Generating Solutions Using Futuring." | Yes | 2 hrs. |
| **Exercise:** Submit the assessment titled "Exponents and Distance, Rate, and Time." | Yes | 2.5 hrs. |
| **Project:** Complete Task 3 of the project. | No | 1.5 hrs. |

Total Out-Of-Class Activities: 18.75 Hours

## MODULE 4: DECIDING THE COURSE OF ACTION

### COURSE LEARNING OBJECTIVES COVERED

5. Decide the course of action to solve a given problem by employing Kepner-Tregoe strategies.
8. Apply mathematical tools to solve problems.

### TOPICS COVERED

- Kepner-Tregoe (K.T.) Approach
- Perimeter and Area for Basic Geometrical Shapes
- Volume for Common Three-Dimensional Figures
- Surface Area for Three-Dimensional Figures

| MODULE LEARNING ACTIVITIES | GRADED | OUT-OF-CLASS TIME |
|---|---|---|
| **Reading:** *Strategies for Creative Problem Solving (Custom ed.),* Chapter 7, pp. 139–163. | No | 1.5 hrs. |
| **Reading:** ITT Tech Virtual Library > School of Study > General Education Information > Recommended Links > Mathematics > Practical Algebra Lessons from Purplemath > Preliminary Topics > Geometric Formulas | No | 1.5 hrs. |
| **Lesson:** Study the lesson for this module. | No | 2 hrs. |
| **Analysis:** Submit the assessment titled "K.T. Situation Appraisal." | Yes | 3 hrs. |
| **Analysis:** Submit the assessment titled "K.T. Decision Analysis." | Yes | 3.5 hrs. |
| **Short Answer:** Submit the assessment titled "K.T. Potential Problem Analysis." | Yes | 3.5 hrs. |
| **Exercise:** Submit the exercise titled "Basic Geometrical Problems." | Yes | 2 hrs. |
| **Project:** Complete Task 4 of the project. | No | 1 hr. |

Total Out-Of-Class Activities: 18 Hours

## MODULE 5: IMPLEMENTING AND EVALUATING THE SOLUTION

### COURSE LEARNING OBJECTIVES COVERED

6. Formulate a plan to implement a solution for a given problem using a methodical approach.
7. Evaluate the effectiveness of a solution by applying standard guidelines, checklists, and considerations.
8. Apply mathematical tools to solve problems.

### TOPICS COVERED

- The Implementation Process
- Methods of Evaluation
- Basics of Graphing

| MODULE LEARNING ACTIVITIES | GRADED | OUT-OF-CLASS TIME |
|---|---|---|
| **Reading:** *Strategies for Creative Problem Solving (Custom ed.),* Chapter 8, pp. 173–188 and Chapter 9, pp. 193–204. | No | 2 hrs. |
| **Reading:** ITT Tech Virtual Library > School of Study > General Education Information > Recommended Links > Mathematics > Interactive Mathematics > Graphs > Functions and Graphs > Introduction to Functions, Functions from Verbal Statements, Rectangular Coordinates, and The Graph of a Function | No | 2 hrs. |
| **Reading:** ITT Tech Virtual Library > School of Study > General Education Information > Recommended Links > Mathematics > Practical Algebra Lessons from Purplemath > Beginning Algebra Topics > x, y-Plane | No | 2.5 hrs. |
| **Lesson:** Study the lesson for this module. | No | 2 hrs. |
| **Exercise:** Submit the exercise titled “Developing a Gantt Chart.” | Yes | 2 hrs. |
| **Analysis:** Submit the assessment titled “Evaluating the Proposed Options I.” | Yes | 3 hrs. |
| **Analysis:** Submit the assessment titled “Evaluating the Proposed Options II.” | Yes | 2 hrs. |

| MODULE LEARNING ACTIVITIES | GRADED | OUT-OF-CLASS TIME |
|---|---|---|
| **Exercise:** Submit the exercise titled "Graphing." | Yes | 2 hrs. |
| **Project:** Complete Task 5 of the project. | No | 1 hr. |

Total Out-Of-Class Activities: 18.5 Hours

## MODULE 6: PUTTING ALL THE PIECES TOGETHER

### COURSE LEARNING OBJECTIVES COVERED

2. Gather the relevant information regarding a problem situation by using critical analysis of information and interviewing.
3. Identify the correct problem in a given scenario by using various problem definition techniques.
4. Apply idea generation techniques to generate possible solutions for a given problem.
5. Decide the course of action to solve a given problem by employing Kepner-Tregoe strategies.
6. Formulate a plan to implement a solution for a given problem using a methodical approach.
7. Evaluate the effectiveness of a solution by applying standard guidelines, checklists, and considerations.
8. Apply mathematical tools to solve problems.

### TOPICS COVERED

- Finding and Correcting a Problem Using Troubleshooting
- Introduction to Polynomials

| MODULE LEARNING ACTIVITIES | GRADED | OUT-OF-CLASS TIME |
|---|---|---|
| **Reading:** *Strategies for Creative Problem Solving (Custom ed.),* Chapter 10, pp. 213–229 and Chapter 11, pp. 235–260. | No | 2 hrs. |
| **Reading:** ITT Tech Virtual Library > School of Study > General Education Information > Recommended Links > Mathematics > College Algebra > Tutorial 6: Polynomials | No | 2.5 hrs. |
| **Reading:** ITT Tech Virtual Library > School of Study > General Education Information > Recommended Links > Mathematics > College Algebra > | No | 2.5 hrs. |

| | | |
|---|---|---|
| Tutorial 7: Factoring Polynomials | | |
| **Lesson:** Study the lesson for this module. | No | 1 hr. |
| **Exercise:** Submit the exercise titled "Multiplying and Factoring Polynomials." | Yes | 2 hrs. |
| **Project:** Complete Task 6 and submit the entire project for grading. | Yes | 2.5 hrs. |

Total Out-Of-Class Activities: 12.5 Hours

# EVALUATION AND GRADING

## EVALUATION CRITERIA

The graded assignments will be evaluated using the following weighted categories:

| CATEGORY | WEIGHT |
|---|---|
| Exercise | 15% |
| Discussion | 10% |
| Analysis | 30% |
| Project | 30% |
| Short Answer | 15% |
| TOTAL | 100% |

## GRADE CONVERSION

The final grades will be calculated from the percentages earned in the course, as follows:

| GRADE | | PERCENTAGE |
|---|---|---|
| A | (4.0) | 90–100% |
| B+ | (3.5) | 85–89% |
| B | (3.0) | 80–84% |
| C+ | (2.5) | 75–79% |
| C | (2.0) | 70–74% |
| D+ | (1.5) | 65–69% |
| D | (1.0) | 60–64% |
| F | (0.0) | <60% |

# LEARNING MATERIALS AND REFERENCES

## REQUIRED RESOURCES

### COMPLETE TEXTBOOK PACKAGE

- Fogler, H. S. & LeBlanc, S. E. (2008). *Strategies for creative problem solving (Custom* ed.). Upper Saddle River, NJ: Pearson.
- William S. Addison Wesley Higher Education. (2008). *Mathematics in action concept videos CD (Custom 1st ed.). Boston, MA: Pearson.*

## RECOMMENDED RESOURCES

- Books and Professional Journals
  - Buzan, B., & Buzan, T. (1996). *The mind map book: How to use radiant thinking to maximize your brain's untapped potential. New York City, NY: Plume.*
  - Buzan, T. (1991). *Use both sides of your brain: New mind-mapping techniques (3rd ed.). New York City, NY: Plume.*
  - Treffinger, D. J., Isaksen, S. G., & Stead-Dorval, K. B. (2006). *Creative problem solving: An introduction (4th ed.). Waco, TX: Prufrock Press Inc.*
- ITT Tech Virtual Library (accessed via Student Portal | https://studentportal.itt-tech.edu)
  - Browse> Browse by Subject> Books>Ebrary
    - Rowland, R. (2000).*Creative guide to research: How to find what you need... online or offline. Franklin Lakes, NJ: Career Press, Inc.*
  - Browse> Browse By Subject> Books> Books24x7
    - Adair, John Eric. (2010). *Decision making and problem solving strategies (2nd ed.). Philadelphia, PA: Kogan Page.*
    - Simon, Julian Lincoln (2000). *Developing decision-making skills for business. Armonk, NY: M. E. Sharpe.*
  - Research Help> Research Guides> Guides by Subject> Tips for Math Success> Math Tips>
    - Recognize what you know and practice what you don't know > InterAct Math
    - Math Videos (left sidebar)> Khan Academy

- Other References

- Math.com Math Practice: http://www.math.com/students/practice.html (accessed 3/9/2012)
  Math Practice provides a good practice sequence for you to receive immediate feedback on whether or not you tackled a problem correctly.
- Mind Tools http://www.mindtools.com/ (accessed 4/25/2012)
- *Covey, S. R. (1990). The 7 habits of highly effective people. New York City, NY: Free Press.*
- Covey, S. R. (1990). *The 7 habits of highly effective people personal workbook. New York City, NY: Free Press.*

**NOTE:** All links are subject to change without prior notice.

## INSTRUCTIONAL METHODS AND TEACHING STRATEGIES

The curriculum employs a variety of instructional methods that support the course objectives while fostering higher cognitive skills. These methods are designed to encourage and engage you in the learning process in order to maximize learning opportunities. The instructional methods include but are not limited to lectures, collaborative learning options, use of technology, and hands-on activities.

To implement the above-mentioned instructional methods, this course replicates the sequence of the five-step problem solving heuristic, focusing on covering one step—and at times, two steps—in each module. The course also intends to provide you exposure to some basic math concepts to help you prepare for future courses that include problem analysis and mathematical applications. The strategy is to cover one or more basic math concepts in each module except Module 1. Wherever possible, the course will focus on real-life application of math in problem solving. Your progress will be regularly assessed through a variety of assessment tools including exercises, discussions, analyses, short-answer questions, and a project.

## OUT-OF-CLASS WORK

For purposes of defining an academic credit hour for Title IV funding purposes, ITT Technical Institute considers a quarter credit hour to be the equivalent of: (a) at least 10 clock hours of classroom activities and at least 20 clock hours of outside preparation; (b) at least 20 clock hours of laboratory activities; or (c) at least 30 clock hours of externship, practicum or clinical activities. ITT Technical Institute utilizes a “time-based option” for establishing out-of-class activities which would equate to two hours of out-of-class activities for every one hour of classroom time. The procedure for determining credit hours for Title IV funding purposes is to divide the total number of classroom, laboratory, externship, practicum and clinical hours by the conversion ratios specified above. A clock hour is 50 minutes.

A credit hour is an artificial measurement of the amount of learning that can occur in a program course based on a specified amount of time spent on class activities and student preparation during the program course. In conformity with commonly accepted practice in higher education, ITT Technical Institute has institutionally established and determined that credit hours awarded for coursework in this program course (including out-of-class assignments and learning activities

described in the “Course Outline” section of this syllabus) are in accordance with the time-based option for awarding academic credit described in the immediately preceding paragraph.

## ACADEMIC INTEGRITY

All students must comply with the policies that regulate all forms of academic dishonesty or academic misconduct. For more information on the academic honesty policies, refer to the Student Handbook and the Course Catalog.

## INSTRUCTOR DETAILS

| | |
|---|---|
| Instructor Name | |
| Office Hours | |
| Contact Details | |

*(End of Syllabus)*