

Certification Exam Handbook Fundamentals of Technology

Offered by:



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THE ASSOCIATION OF SCIENCE
AND ENGINEERING TECHNOLOGY
PROFESSIONALS OF ALBERTA

Table of Contents

Introduction	3
Examination Information	3
Purpose of Examination.....	3
Examination Format	3
Eligibility.....	3
Examination Registration.....	3
Booking Window.....	4
Location of Examination Centres and Virtual Proctoring	4
Exam Time and Location Confirmation.....	6
Policy for Reschedules, Rewrites, and Attempts	6
COVID-19 Cancellation Policy.....	6
Exam Accommodations for Candidates with Disabilities	6
Examination Content.....	8
Study Resources for Examination	9
Practice Exam for Purchase	10
Day of Examination.....	10
Admission to the Examination Centre.....	10
Permissible Items	11
Prohibited Items.....	11
Calculator Policy.....	11
Taking the Exam.....	11
After the Examination.....	12
Examination Scoring.....	12
Pass Mark.....	12
Results.....	12
Review and Appeal Process.....	12
Appendix A: Fundamentals of Technology Exam Blueprint	13

Introduction

The **Fundamentals of Technology Certification Exam Handbook** has been prepared for engineering and applied science technologists who are required to pass a certification exam to achieve registration as a Certified Engineering Technologist or Applied Science Technologist. The handbook is designed to provide candidates with essential information regarding the certification examination.

Examination Information

Purpose of Examination

The purpose of the Fundamentals of Technology Certification Examination is to identify capable engineering and applied science technologists who possess technical competencies in their discipline of practice. The goal is to protect the public by granting designations only to those professionals who have the skill and knowledge necessary to perform their job in a safe and competent manner.

Examination Format

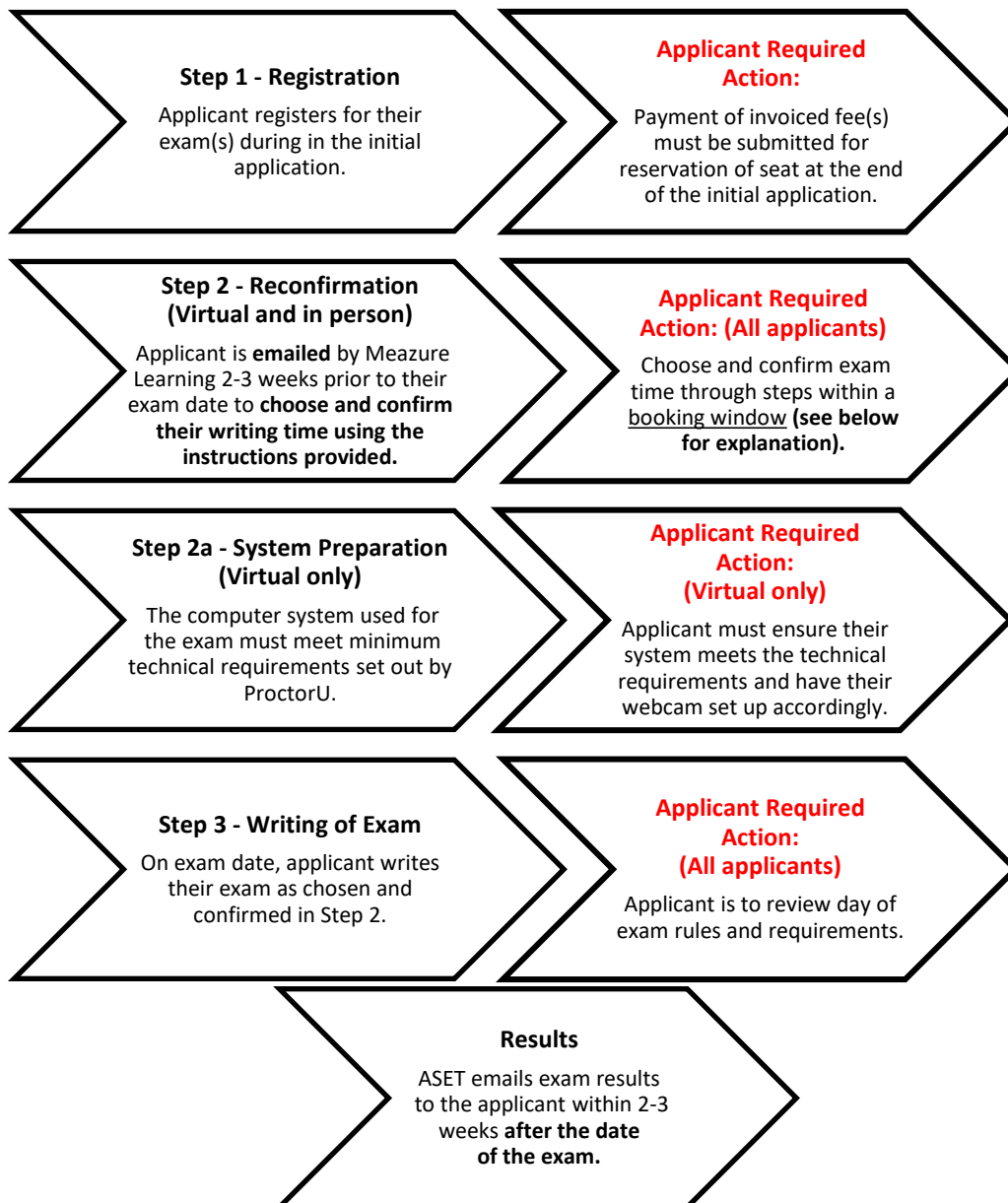
The examination consists of 110 multiple-choice questions, including questions with graphs, diagrams, and schematics and questions that require calculations. There are 10 experimental questions of the 110 that are not counted towards the candidate's exam score. These items are used for future exam development following the Embedded Field Testing Method. Each multiple-choice question has four answer options, only one of which is correct. Exam questions vary in the level of cognitive difficulty. The exam is closed-book and is three hours in duration.

Eligibility

To be eligible to write the exam, candidates must have at least 24 months of work experience at the technologist level. For this reason, student and T.T. members may not register to write the exam.

Examination Registration

Applicants who are required to complete the Fundamentals of Technology Certification Examination will register for the examination at the time of application. Please see the ASET, CTTAM, or ASTTBC websites for current information on examination dates and deadlines.



Booking Window

Two to three weeks prior to the exam, you will receive a booking email from Meazure Learning. This email will include the instructions on how to book a seat for your exam. We recommend watching this [quick video demonstration](#) on how to reserve your seat. Please note that these instructions are for the Virtual Booking; however, it is the same process if you are scheduled to write the exam at a brick-and-mortar (physical) location.

Location of Examination Centres and Virtual Proctoring

The Fundamentals Technologist Certification Exam is administered on a computer in one of Meazure Learning’s exam centres or through the virtual proctoring service.

Physical locations in Alberta include Edmonton, Calgary, Grande Prairie*, and Lethbridge*. Please contact ASTTBC or CTTAM for information on testing centres in British Columbia and Manitoba. **limited seating*

Virtual Proctoring: This method of exam delivery uses a webcam with a virtual proctor to allow the candidate to write the exam from a home or work office. This method has the following additional requirements:

Exam room requirements

- Quiet and private room; **if anyone enters the room during the exam other than the above the candidate, the exam results may be invalidated**
- Location can be at personal residence or from the office**(see note at end)
- Good quality lighting in the room; no bright lights or windows behind candidate
- Desk must be clear of any notes, books, or electronics with access to power outlets and internet connection (Ethernet plugged or high quality password protected Wi-Fi)

Internet requirements

- Stable, secure (must be password protected if Wi-Fi) high speed internet connection with download speeds of at least 3 Mbps and upload speeds of at least 1.5 Mbps (a free internet speed testing tool is available at www.speedtest.net to test the internet connection).

Computer requirements

- Laptops or desktop computers are permitted so long as they have the following minimum requirements:
 - <https://support.proctoru.com/hc/en-us/articles/115011772748-Equipment-Requirements>
 - Candidates must source their own computers with the minimum specifications for the exam.
 - No virtual machine desktops, must be on the host desktop or tablets or smartphones.
 - Google Chrome required
 - Please ensure that laptops are plugged in during the exam to prevent the exam terminating early due to battery failure.
- Functioning free standing or integrated webcam w/ microphone or independent microphone

NOTE: It is the candidate's responsibility to ensure that the internet and computer requirements are met prior to the exam administration date. The **compatibility check** information will be located in your BOOKING CONFIRMATION email which is sent by Meazure Learning.

- **Applicants must conduct a compatibility check using the computer they will use, in the room they will write in to test their connectivity prior to the virtually proctored exam. If they do not complete the compatibility check, there is no guarantee that the exam will happen. *The ProctorU exam program cannot be downloaded until the day of your exam so there is no way to check if it will work prior to exam day.***
- Meazure Learning has an [FAQ page](#) with a short tutorial video on the ProctorU program.

***Keep in mind administrative privileges on the computer you will use (some company's IT policies block download of the required program to use with ProctorU and can cause issues). As stated on page 5, it will be important to complete the compatibility check **PRIOR** to the examination date.*

Exam Time and Location Confirmation

All candidates will receive a confirmation email with the writing time and address of the testing centre location (physical location only) that was chosen at the time of application by **email from Meazure Learning one to two weeks before the exam date**. The confirmation email is important to review and a printed copy is required for admission to write the exam. Candidates can contact Meazure Learning directly at testingsupport@meazurelearning.com to have the exam registration information re-sent if they did not receive the confirmation email by the deadline above.

Policy for Reschedules, Rewrites, and Attempts

Alberta Candidates

Candidates who wish to reschedule their exam must email the ASET Registration Department (exams@aset.ab.ca) with the new exam date. Candidates who reschedule **after the registered exam's Registration Deadline Date** are required to pay **the full exam fee** to reschedule. If the request is received **before** this deadline date, then there are no fees to reschedule.

Candidates who are required to re-write the examination must email the ASET Registration Department (exams@aset.ab.ca) with the requested exam date. ASET Staff will follow up to obtain payment of the full exam fee in order to register for the requested date.

Candidates may attempt the exam **a maximum of three times** within one year from the date of application and must pass the exam within this time period.

British Columbia and Manitoba Candidates

Please contact ASTTBC or CTTAM directly to confirm the policy for reschedules, rewrites, and exam attempts.

COVID-19 Cancellation Policy

If a candidate falls ill on the day of the exam and has flu/cold symptoms, please contact exams@aset.ab.ca immediately. If writing at a testing centre, candidates will be denied entry and will be unable to write the exam.

Upon contacting ASET, the exam will be cancelled. To waive the examination fee to reschedule again, proof of positive test will be required.

Exam Accommodations for Candidates with Disabilities

According to Canadian human rights legislation and test industry standards, exam developers are responsible for providing candidates with disabilities with exam accommodations where appropriate and feasible. Exam accommodations are designed to remove barriers related to individual characteristics of candidates that may prevent them from demonstrating their technical competencies on the exam. "An appropriate accommodation is one that that responds to specific individual characteristics but does so in a way that does not change the construct the test is measuring or the meaning of scores."

Candidates with disabilities should request accommodations to write the certification exam at the time of application and at least **seven (7) weeks before the exam date of their choice by submitting a request in writing to the ASET, ASTTBC, or CTTAM**. To protect the integrity of the examination, documented evidence of the candidate's disability must be submitted to ASET, CTTAM, or ASTTBC along with the application form. Such evidence includes a formal detailed diagnosis of the specific disability from an appropriate professional (e.g., physician, psychologist, rehabilitation counsellor) and supporting documentation citing the need for exam accommodations and what accommodations the candidate received in the past.

ASET, CTTAM, or ASTTBC will review the candidate's written request for accommodation and determine if it can be supported. Depending on the candidate's individual needs, ASET, CTTAM, or ASTTBC may modify exam administration conditions, including exam setting, exam presentation, or the addition of individuals to the exam (e.g., readers, scribes). Each request will be reviewed on a case-by-case basis.

Below is a list of reasonable exam accommodations for candidates with a disability.*

1. *Separate Room*

A separate room is provided to candidates who due to the nature of their disability require an exam environment that minimizes distractions resulting from noise or movement or process information by talking aloud.

2. *Additional Time*

Extending additional time to candidates is a frequently used exam accommodation that is used with a variety of disability-related conditions. Often candidates are offered time-and-one-half to complete the exam (e.g., a 3-hour exam is extended to 4.5 hours).

3. *Interpreter*

Candidates with hearing impairment may request an interpreter who has proficiency in sign language.

4. *Reader*

A reader is an individual who reads exam instructions and/or exam questions to a candidate. Candidates with visual impairment or those with a learning disability may benefit from services of a reader during the examination.

5. *Recorder*

A recorder is an individual who fills in the answers for a candidate who has difficulty writing independently.

***All costs related to exam accommodations will be the responsibility of the candidate.**

Examination Content

The Fundamentals of Technology Certification Examination questions are divided into four modules, including mathematics, statistics, chemistry, and physics. **Table 1** provides the weighting of each module on the examination, as well as topics, which are tested within each module. **See Appendix A for a detailed breakdown of the competencies that are tested on the examination.**

Table 1. Description of Fundamentals of Technology Examination by Topic

Topic	Percentage of Questions	Number of Questions
1. Mathematics	35-45%	35-45
2. Statistics	5-15%	5-15
3. Chemistry	15-25%	15-25
4. Physics	20-30%	20-30
Total	100%	100

Exam questions will also vary in cognitive level. *Knowledge* questions require that candidates recall information and provide its interpretation. *Application* questions require that candidates apply their knowledge to practical situations, while *Critical thinking* questions require that candidates analyze complex situations and provide solutions. There will also be a percentage of source based questions that may include an image, figure, tables, schematics, etc. **Refer to Appendix A for more detailed information.**

Study Resources for Examination

The following resources may be of use to candidates interested in refreshing their knowledge prior to writing the examination. **Candidates are not expected to study each of these resources as the certification exam is designed to test entry-level competencies related to the fundamentals of technology.** Rather, candidates may wish to review particular content areas in which they feel they would like to update their current knowledge. For detailed information on the content areas covered on the exam, candidates should refer to **Appendix A**.

Gibilisco, S. (2011). *Geometry demystified*.

Giordano, N. (2012). *College physics* (Vol. 1).

Hewitt, P. G. (2002). *Conceptual Physics*.

Kenkel, J. (2011). *Basic chemistry: Concepts and exercises*.

Mahaffy, P. G. (2014). *Chemistry: Human activity, chemical reactivity*.

Mott, R. L. (2006). *Applied fluid mechanics* (6th ed.).

Mott, R. L. (2008). *Applied strength of materials* (5th ed.).

Newman, J. (2010). *Physics of the Life Sciences*.

Northrop, R. B. (2014). *Introduction to Instrumentation and Measurements* (3rd ed.).

Platt, D. (2010). *Applied mechanics*.

Steege, R., & Bailey, K. (2010). *Intermediate algebra* (2nd ed.).

Triola, M. (2014). *Elementary statistics* (12th ed.).

Walker, K. M. (2008). *Applied mechanics for engineering technology* (8th ed.).

Washington, A. (2014). *Basic technical mathematics with calculus* (10th ed.).

Whitten, K., Davis, R., Peck, M. L., & Stanley, G. (2014). *Chemistry* (10th ed.).

Zumdahl, S., & DeCoste, D. J. (2014). *Basic chemistry*.

Practice Exam for Purchase

Practice exam questions are available for purchase through [Meazure Learning](#). As these questions are hosted by a third-party educational partner, candidates will need to create a new account to access the practice exam. This login is **not associated** with the candidate's ASET ID.

A one-time attempt practice exam of 25 questions* is available.

*While the candidate is able to repurchase the same practice exam at a later date; the questions will not change.

Day of Examination

Admission to the Examination Centre

ASET, CTTAM, and ASTTBC provide Meazure Learning with a list of examination candidates for each exam sitting. When an exam appointment is made, candidates will receive a booking confirmation email from Meazure Learning. **It is important that candidates bring this email with them to an examination center on the day of the examination.**

Upon entering the examination center, candidates will be asked to register with the proctor. The following information will need to be provided to the proctor.

- Candidate's first and last name (must match candidate's registration as submitted by ASET, CTTAM, or ASTTBC)
- Valid government-issued photo ID (not expired)
- Candidate's printed confirmation email as provided by Meazure Learning

Important Notes:

- If you have a non-expired temporary driver's license you must also provide another form of photo identification. The first and last name on both documents must match. It is preferred that the photo identification not be expired.
- If your only form of photo identification has expired you must also provide another form of non-expired identification. The first and last name on both documents must match.
- If you have any other concerns about your forms of identification, please contact Meazure Learning support immediately to ensure your identification will be accepted on exam day:
testingsupport@meazurelearning.com.

After the initial verification of identity, candidates will be asked to sign a roster.

Candidates' personal belongings, such as bags and jackets, will be stored in a designated area. Electronic devices, including but not limited to cell phones, tablets, and reference books, may not under any circumstances be brought into the exam center. The only exception to this rule is personal calculators. The proctor is responsible for inspecting candidate's calculators prior to the exam.

Permissible Items

- Disposable ear plugs (provided by candidate)
- Scrap paper and pencils will be provided by the proctor to the candidates before the exam (if requested) and collected after the exam
- Approved calculator (see policy below)
- Formula sheet (provided by the proctor at the examination)

Prohibited Items

- Electronic devices (i.e., cell phones, pagers, digital assistants etc.)
- All types of food and beverages
- Unauthorized examination aids, assistance or collaboration materials

Calculator Policy

- Candidates can bring in a Scientific Calculator that is non-programmable, non-graphing and have no memory storage capabilities.
- Please review the [Calculator Policy](#) prior to examination day. It contains a list of approved and non-approved calculator models
- It is highly recommended that the candidate bring their own calculator as the centre does not have any on site.
- It is the candidate's responsibility to ensure their calculator is approved prior to the exam, either by being indicated on the approved list or by obtaining approval from ASET, CTTAM, or ASTTBC. If a candidate does not obtain approval prior to the exam, their calculator may be deemed inadmissible and prohibited from the exam.

Taking the Exam

At the beginning of the examination, candidates will hear verbal examination instructions from the proctor and read the Candidate's Statement of Understanding and/or Non-disclosure Agreement in the software. Failure to comply with the regulations outlined in these documents will result in the candidate's results being invalidated. Candidates will not be able to begin the examination without agreeing to the conditions outlined in the document. The assigned ID and chosen password will be used to log in when prompted by the proctor.

Next, candidates will be given written exam instructions in the software. These exam instructions will emphasize the fact that some exam questions contain images and/or require calculations. If the images appear too small on the screen, candidates will be advised to hover their mouse over them to get an expanded view. Following the exam instructions, there will be a tutorial available to candidates before they proceed to the exam.

The exam is closed-book and is three hours in duration. Once a candidate starts an exam they must complete the exam they started. If the candidate notices they have started the wrong examination, they must notify the proctor within the first 5 minutes of the exam sitting to switch to the correct exam.

Upon submitting their exam responses, candidates will be offered an opportunity to provide feedback on exam material and exam administration conditions by completing a short online survey. **Results of the exam are not provided to the candidates at this time.** Candidates will then submit their scrap paper to the proctor, sign out from the candidate roster, and leave the examination centre.

After the Examination

Examination Scoring

Multiple-choice examination questions are scored dichotomously, using a score of “0” for an incorrect response and a score of “1” for a correct response. The Technologist Certification Examinations are criterion-referenced exams, which means that a candidate should obtain a score that is equal or higher than an exam pass mark to pass the examination.

Pass Mark

Each Certification Examination has its own pass mark. The pass mark for the Fundamentals of Technology Certification Examination was determined by the Exam Committee, which took into account the difficulty of exam questions and the expected level of performance for a minimally competent engineering technologist. A psychometrically acceptable standard-setting methodology was used to set examination pass marks.

The pass mark for the Fundamentals of Technology Certification Exam is 64%.

Results

Candidates are emailed their exam results **within two to three weeks after the exam date.** Exam results are reported to the candidate as “pass” or “fail”.

Unsuccessful candidates will also receive a performance report indicating a failure to pass, their score, and areas of strength and weakness in the four tested competency areas. The unsuccessful candidates will be able to retake the exam. Please refer to the Rewrite Policy section in this handbook to schedule the next exam.

Review and Appeal Process

A candidate who fails the Certification Examination may request that their exam score be verified. Due to the automated scoring and extensive quality control procedures, errors in scoring are extremely unlikely. However, candidates may request that ASET, CTTAM, or ASTTBC manually rescore their exam to verify the original score.

Appendix A: Fundamentals of Technology Exam Blueprint

ASET Fundamentals of Technology Certification Examination Blueprint		
Competency	Multiple Choice Questions	
	Target Range (% of Qs)	Target Range (# of Qs)
1. Mathematics	35-45%	35-45
1.1 Basic Mathematics and Linear Algebra		
1.1.1 Solve algebraic equations using the basic laws of algebra		
1.1.2 Analyze and solve systems of linear equations, including simultaneous linear equations		
1.1.3 Explain the application of matrices		
1.1.4 Solve inequalities in one and two variables		
1.1.5 Explain the relationship between accuracy and significant digits		
1.1.6 Perform calculations using the proper order of mathematical operations		
1.1.7 Perform unit conversion using imperial units and SI units		
1.2 Calculus		
1.2.1 Identify a slope of a tangent to a curve		
1.2.2 Compute functional values		
1.2.3 Numerically approximate the area under a curve		
1.3 Differential Equations		
1.3.1 Perform basic mathematical operations with complex numbers		
1.4 Analytical Geometry and Trigonometry		
1.4.1 Describe various coordinate systems		
1.4.2 Solve geometry problems on a coordinate plane		
1.4.3 Determine distances between points and ratios of lengths of segments between points		
1.4.4 Apply equations of parallel and perpendicular lines		
1.4.5 Identify intersections of geometric objects		
1.4.6 Apply trigonometric functions in solving technology problems		
1.4.7 Solve right-angle triangles using trigonometry		
1.4.8 Solve trigonometric equations		
1.4.9 Carry out the simplification of trigonometric expressions using trigonometric identities		
2. Statistics	5-15%	5-15
2.1 Measures of Central Tendency and Variability		
2.1.1 Differentiate between sample statistics and population parameters		
2.1.2 Define measures of central tendency and variability		
2.1.3 Calculate the mean, median, and mode		

2.1.4 Calculate the range, variance, and standard deviation		
2.1.5 Compute percentiles and standard scores		
2.2 Probability		
2.2.1 Explain the basic tenants of the probability theory		
2.2.2 Calculate simple conditional probabilities		
2.3 Sampling		
2.3.1 Explain the concepts of random, stratified, and clustered sampling		
2.3.2 Apply the appropriate sampling techniques to problems		
3. Chemistry	15-25%	15-25
3.1 Periodic Table		
3.1.1 Explain the nomenclature of the periodic table		
3.1.2 Discuss basic concepts of atomic structure		
3.1.3 Predict the behavior of elements from their positions on the periodic table and their electronic configurations		
3.2 Oxidation and Reduction		
3.2.1 Explain the principles of oxidation and reduction		
3.3 Acids and Bases		
3.3.1 Describe the properties of acids and bases		
3.3.2 Interpret pH indicators in aqueous solutions		
3.4 Gas Laws		
3.4.1 Explain how gas adapts in response to changes in volume and pressure		
3.4.2 Explain how gas adapts in response to changes in temperature and volume		
3.5 Liquids, Solids, and Gases		
3.5.1 Describe the properties of liquids, solids, and gases		
3.5.2 Determine the concentration of solutions		
3.6 Material Science		
3.6.1 Describe the properties of common materials found in engineering applications (e.g., ferrous alloys, polymers, ceramics)		
3.6.2 Recognize stress and strain caused by axial loads, bending loads, torsion, or shear		
3.6.3 Explain the application of common non-destructive material testing methods		
3.6.4 Describe common forms of material degradation		
4. Physics	20-30%	20-30
4.1 Thermodynamics		
4.1.1 Explain the concepts of energy, heat, and thermal expansion and contraction		
4.1.2 Define thermodynamic properties and processes		
4.1.3 Explain the concept of thermodynamic equilibrium		
4.1.4 Describe methods of heat transfer (e.g., conduction, convection, and radiation)		
4.1.5 Solve problems involving the transfer of thermal energy and heat loss		
4.2 Electricity, Power, and Magnetism		

4.2.1 Apply the concepts of electrical charge, current, voltage, resistance, and power		
4.2.2 Apply electrical current and voltage laws (Kirchhoff and Ohm)		
4.2.3 Explain the principles of operation of DC and AC circuits		
4.2.4 Describe the properties of electrical and magnetic fields		
4.3 Statics		
4.3.1 Recognize resultants of force systems and vector analysis		
4.3.2 Calculate dimensional properties		
4.3.3 Apply Newton's laws to static problems		
4.4 Dynamics		
4.4.1 Explain the concepts of speed, velocity, and acceleration		
4.4.2 Describe Newton's first, second, and third laws of motion		
4.4.3 Apply Newton's laws to dynamic problems		
4.4.4 Calculate mass and weight		
4.4.5 Determine the individual forces acting upon an object		
4.4.6 Define the concepts of work, kinetic and potential energy, and power		
4.5 Fluid Dynamics		
4.5.1 Describe physical properties of fluids		
4.5.2 Distinguish between laminar and turbulent flow		
4.5.3 Define hydrostatic pressure		
4.5.4 Perform calculations for a flow rate		
4.5.5 Identify friction losses		
4.6 Measurement and Instrumentation		
4.6.1 Analyze the principles of operation of instruments		
4.6.2 Select measurement instruments for specific applications		
Total	100%	100

Cognitive Level	Multiple-choice Questions	
	Target Range (% of Qs)	Target Range (# of Qs)
Knowledge	60-70%	60-70
Application	20-30%	20-30
Critical Thinking	5-15%	5-15
Total	100%	100

Question Type	Multiple-choice Questions	
	Target Range (% of Qs)	Target Range (# of Qs)
Questions with Images	15-25%	15-25
Questions without Images	75-85%	75-85
Total	100%	100