

DE4101 ENGINEERING FUNDAMENTALS**Level 4****Credits 15****Version September 2010****LEARNING TIME**

Indicative Directed Hours	Self Directed Hours	Total Hours
90	60	150

RECOMMENDED PRE-REQUISITE

Nil

RECOMMENDED CO-REQUISITE

Nil

AIM/PURPOSE

To introduce the basic fundamentals of a range of engineering disciplines.

LEARNING OUTCOMES

On successful completion of this course, the student should be able to:

1. Demonstrate an understanding of, and apply, the fundamentals of statics, dynamics and mechanical energy concepts.
2. Evaluate direct stress and strain, and derive elastic properties from tensile test results.
3. Demonstrate an understanding of the engineering properties of fluids and apply the fundamentals of hydrostatics.
4. Demonstrate an understanding of electrical voltage, current and resistance and explain the difference between AC and DC.
5. Demonstrate awareness of the New Zealand Electricity system and describe some of its safety features.
6. Demonstrate an understanding of heat energy and transfer; temperature and humidity of air.

INDICATIVE CONTENT

- SI units, Units conversion; Scalars, Vectors, Force, Components of a force; Analysis of concurrent force systems; Moment of a force, Conditions of static equilibrium, beam support reactions; First moment of area, Centroid, Centre of gravity; Velocity, Acceleration, Linear motion; Newton's laws of motion; Friction on level surfaces; Work and Power; Potential- and Kinetic energy, Conservation of energy
- Tensile-, Compressive- and Shear stress and strain; Tensile test, Elastic Modulus

- Fluid properties: Density, Specific gravity, Specific Weight, Viscosity; Pressure, head, gauge pressure, absolute pressure, manometers
- Electron flow, voltage, current, resistance, batteries, generators, Ohm's law, use of multimeter, AC and DC applied to resistive circuits
- Overview of the power distribution system, MEN system, protection and safety
- Radiant, conductive and convective heat energy. Thermal mass and thermal conductivity. Latent heat of vaporization and freezing. Simple temperature sensors and sources of errors in measurement

ASSESSMENT

Assessment Type	Weighting	Outcomes assessed
Tests	20%	1, 2, 3
Assignments/Practicals	30%	Any 3 of 1, 2, 3, 4, 6
Examination	50%	1, 2, 3, 4, 5, 6

LEARNING AND TEACHING STRATEGIES

As appropriate to the discipline and to the practice and resources of the delivering Institution. Typically a blend of the following:

Lectures

Tutorials

Formative assessments

Web technologies

Computer simulation

Project investigations

Visiting guest lecturers

Videos

Laboratories

Group work

IPENZ TECHNICIAN ATTRIBUTES

	IPENZ GRADUATE ATTRIBUTES	OUTCOME
1.	Knowledge of Engineering Sciences	1, 2, 3, 4, 5, 6
2.	Analysis and Problem Solving	1, 2, 3, 4, 5, 6
3.	Design and Synthesis	
4.	Investigation and Research	
5.	Evaluation and Management of Risk	
6.	Team Work	
7.	Communication	
8.	Ethics and Responsibility to Society	
9.	Management and Financial	
10.	Practical knowledge and application	

DE4102 ENGINEERING MATHEMATICS 1**Level 4****Credits 15****Version September 2010****LEARNING TIME**

Indicative Directed Hours	Self Directed Hours	Total Hours
90	60	150

RECOMMENDED PRE-REQUISITE

Nil

RECOMMENDED CO-REQUISITE

Nil

AIM/PURPOSE

To develop mathematical skills, concepts and understandings in order to perform calculations and solve problems within engineering contexts.

LEARNING OUTCOMES

On successful completion of this course, the student should be able to:

1. Manipulate and solve algebraic expressions and equations.
2. Solve, manipulate and apply mathematical functions, including application of graphs where appropriate.
3. Apply the rules and principles of trigonometry using both degree and radian measure.
4. Demonstrate knowledge of differentiation and integration techniques and apply them to solve engineering problems.
5. Demonstrate knowledge and application of one of the following:
 - 5.1 Complex numbers, logic expressions and numbers
 - OR
 - 5.2 Basic statistical concepts and techniques.

INDICATIVE CONTENT

- Rules for simplifying, factorising, exponents and fractions; Simple manipulation of surds; Linear equations

- Basic functions: linear-, quadratic-, exponential-, logarithmic functions; Solve quadratic, exponential and log equations; Solve simultaneous equations; Graphs: linear-, polynomial-, exponential-, logarithmic-, simple rational functions; Amplitude, frequency, period, phase displacement and time displacement of a graph
- Trigonometric identities and formulae; Degree and radian measure; Solve trigonometric equations; Graph trigonometric functions; Calculation of areas and volumes
- Differentiation and integration rules and concepts; Applications of differentiation: tangent to a curve, minima and maxima, optimisation techniques, rate of change of time dependent variables, growth and decay rates; Applications of integration: Area under a curve, mean value, RMS (non-trigonometric only), first and second moments of area, Simpson's rule.
- Complex numbers: rectangular and polar conversion, quadratic equations with complex roots, Logic expressions and numbers: Conversions between and operations on binary, hexadecimal, decimal and binary coded decimal numbers; Boolean algebraic expressions.
- Mean, median, range, standard deviation, Scatter diagrams, Regression analysis, Correlations.
- Use spreadsheets throughout as appropriate.

ASSESSMENT

Assessment Type	Weighting	Outcomes Assessed
Assignments	30%	1, 2, 3, 4, 5
Tests	20%	1, 2, 3, 4, 5
Examination	50%	1, 2, 3, 4, 5

LEARNING AND TEACHING STRATEGIES

As appropriate to the discipline and to the practice and resources of the delivering Institution. Typically a blend of the following:

Lectures

Tutorials

Formative assessments

Web technologies

Computer simulation

Laboratories

Videos

Group work

IPENZ TECHNICIAN ATTRIBUTES

	IPENZ GRADUATE ATTRIBUTES	OUTCOME
1.	Knowledge of Engineering Sciences	1, 2, 3, 4, 5
2.	Analysis and Problem Solving	1, 2, 3, 4, 5
3.	Design and Synthesis	
4.	Investigation and Research	
5.	Evaluation and Management of Risk	
6.	Team Work	
7.	Communication	
8.	Ethics and Responsibility to Society	
9.	Management and Financial	
10.	Practical knowledge and application	2, 4

DE4103 TECHNICAL LITERACY**Level 4****Credits 15****Version September 2010****LEARNING TIME**

Indicative Directed Hours	Self Directed Hours	Total Hours
75	75	150

RECOMMENDED PRE-REQUISITE

Nil

RECOMMENDED CO-REQUISITE

Nil

AIM/PURPOSE

To develop technical research skills along with oral, written, graphical and interpersonal communication skills.

LEARNING OUTCOMES

On successful completion of this course, the student should be able to:

1. Utilise information obtained from physical or web based resources in technical problem solving and presentations.
2. Prepare and deliver an oral presentation on a technical subject.
3. Communicate ideas and technical findings in a written format.
4. Create and use pictorial sketches and pictorial/orthographic drawings to current drawing standards as a communication technique to present ideas and data.
5. Demonstrate interpersonal communication skills to develop project outcomes.

INDICATIVE CONTENT

- Technical and business communication to standards and codes including referencing systems, physical and web based resources.
- Interpersonal communication.
- Computer application tools, e.g. word-processing, spreadsheeting, presentation graphics

- Pictorial sketching and basic engineering drawing techniques, orthographic projection, dimensioning principles, principles of drawing office practice and drawing management.

ASSESSMENT

Assessment Type	Weighting	Outcomes Assessed
Written Assessment	30%	1, 3, 5
Oral Presentation	20%	1, 2, 5
Drawing Assessment	50%	4

To pass this course, the student must achieve a total minimum mark of 50%, including a minimum of 50% for learning outcome 4.

LEARNING AND TEACHING STRATEGIES

As appropriate to the discipline and to the practice and resources of the delivering Institution. Typically a blend of the following:

Lectures

Tutorials

Formative assessments

Web technologies

Computer simulation

Project investigations

Visiting guest lecturers

Videos

Laboratories

Group work

IPENZ TECHNICIAN ATTRIBUTES

	IPENZ GRADUATE ATTRIBUTES	OUTCOME
1.	Knowledge of Engineering Sciences	3
2.	Analysis and Problem Solving	3
3.	Design and Synthesis	
4.	Investigation and Research	1, 2
5.	Evaluation and Management of Risk	
6.	Team Work	4
7.	Communication	1, 2, 3, 4
8.	Ethics and Responsibility to Society	1, 2, 3
9.	Management and Financial	
10.	Practical knowledge and application	1, 2, 3

DE4201 MATERIALS (CIVIL)**Level 4****Credits 15****Version September 2010****LEARNING TIME**

Indicative Directed Hours	Self Directed Hours	Total Hours
90	60	150

RECOMMENDED PRE-REQUISITE

Nil

RECOMMENDED CO-REQUISITE

Nil

AIM/PURPOSE

To introduce the fundamentals of geological and geomorphological processes and the properties and application of a range of civil engineering materials.

LEARNING OUTCOMES

On successful completion of this course, the student should be able to:

1. Identify and describe the composition of minerals and rocks, and discuss soil and rock formation processes
2. Demonstrate knowledge and understanding of physical and structural geology and interpret geological maps
3. Describe the causes and effects of earthquakes
4. Describe and evaluate the properties and applications of concrete, metals, timber and new materials in Civil Engineering

INDICATIVE CONTENT

- Common rock forming minerals, Formation and properties of rocks
- Mechanical and chemical weathering, erosion, deposition, land slides
- Structural geology, geological maps
- Earthquake terminology, magnitude, plate tectonics, effects of earthquakes, case studies
- Concrete: cement, aggregates, concrete manufacture, properties, testing, admixtures, hot and cold weather concreting, mix designs and masonry.
- Metals: engineering properties of steel (tensile strength, modulus, hardness, ductility), reinforcing steel. Applications of other metals (aluminium, alloys). Corrosion – causes, effects, protection against. Jointing methods, welding, bolting.

- Timber: strength, durability, conversion, moisture state, seasoning, defects, grading, classification, preservation, wood based products, jointing.
- Geosynthetics, plastics.

ASSESSMENT

Assessment Type	Weighting	Outcomes Assessed
Practicals	10%	1
Assignments / Tests	15%	1, 2, 3
	25%	4
Examination	20%	1, 2, 3
	30%	4

LEARNING AND TEACHING STRATEGIES

As appropriate to the discipline and to the practice and resources of the delivering Institution. Typically a blend of the following:

Lectures

Tutorials

Formative assessments

Visiting guest lecturers

Web technologies

Computer simulation

Videos

Laboratories

IPENZ TECHNICIAN ATTRIBUTES

	IPENZ GRADUATE ATTRIBUTES	OUTCOME
1.	Knowledge of Engineering Sciences	1, 2, 3, 4
2.	Analysis and Problem Solving	
3.	Design and Synthesis	
4.	Investigation and Research	
5.	Evaluation and Management of Risk	
6.	Team Work	
7.	Communication	
8.	Ethics and Responsibility to Society	
9.	Management and Financial	
10.	Practical knowledge and application	

DE4202 LAND SURVEYING 1**Level 4****Credits 15****Version September 2010****LEARNING TIME**

Indicative Directed Hours	Self Directed Hours	Total Hours
90	60	150

RECOMMENDED PRE-REQUISITE

Nil

RECOMMENDED CO-REQUISITE

Nil

AIM/PURPOSE

To understand and apply the theoretical and practical concepts of Land Surveying

LEARNING OUTCOMES

On successful completion of this course, the student should be able to:

1. Understand basic principles of land surveying and use survey instruments.
2. Understand and apply fundamental principles and techniques of levelling, traversing and co-ordinate calculations, and errors distribution
3. Use equipment and apply techniques for field and distance measurements

INDICATIVE CONTENT

- Principles of land surveying, survey instruments and targets, safety in surveying
- Fundamental principles and techniques of levelling, traversing fundamentals, co-ordinate calculations, errors.
- Field and distance measurements, Global Navigation Satellite Systems in land surveying

ASSESSMENT

Assessment Type	Weighting	Outcomes Assessed
Assignments/Practicals	40%	1, 2, 3
Tests	10%	1, 2, 3
Examination	50%	1, 2, 3

LEARNING AND TEACHING STRATEGIES

As appropriate to the discipline and to the practice and resources of the delivering Institution. Typically a blend of the following:

Lectures

Formative assessments

Visiting guest lecturers

Web technologies

Tutorials

Computer simulation

Videos

Practicals

IPENZ TECHNICIAN ATTRIBUTES

	IPENZ GRADUATE ATTRIBUTES	OUTCOME
1.	Knowledge of Engineering Sciences	1, 2, 3
2.	Analysis and Problem Solving	
3.	Design and Synthesis	
4.	Investigation and Research	
5.	Evaluation and Management of Risk	
6.	Team Work	3
7.	Communication	
8.	Ethics and Responsibility to Society	
9.	Management and Financial	
10.	Practical knowledge and application	3

DE5201 STRUCTURES 1**Level 5****Credits 15****Version September 2010****LEARNING TIME**

Indicative Directed Hours	Self Directed Hours	Total Hours
90	60	150

RECOMMENDED PRE-REQUISITE

DE4101 Engineering Fundamentals

RECOMMENDED CO-REQUISITE

Nil

AIM/PURPOSE

To analyse structural elements and simple structures, and to design simple beams.

LEARNING OUTCOMES

On successful completion of this course, the student should be able to:

1. Calculate stresses caused by axial forces, shear forces and bending moments
2. Analyse simple structural elements and -structures
3. Determine the loads on and design statically determinate steel and timber beams

INDICATIVE CONTENT

- Direct stress and strain, elastic behaviour and characteristics, idealised stress/strain relationship for plastic behaviour, stress and strain associated with temperature, creep and shrinkage, bending stress, shear stress, torsional stress, combined stresses
- Analysis of statically determinate beams, pin-jointed trusses, columns
- Permanent actions, imposed actions, load factors, load combinations, actions on floors, actions on horizontal and sloping roofs.
- Design simple steel and timber beams

ASSESSMENT

Assessment Type	Weighting	Outcomes Assessed
Assignment/Projects	40%	1, 2, 3
Tests	10%	1, 2
Examination	50%	1, 2, 3

LEARNING AND TEACHING STRATEGIES

As appropriate to the discipline and to the practice and resources of the delivering Institution. Typically a blend of the following:

Lectures

Tutorials

Formative assessments

Visiting guest lecturers

Web technologies

Computer simulation

Videos

IPENZ TECHNICIAN ATTRIBUTES

	IPENZ GRADUATE ATTRIBUTES	OUTCOME
1.	Knowledge of Engineering Sciences	1, 2, 3
2.	Analysis and Problem Solving	1, 2, 3
3.	Design and Synthesis	3
4.	Investigation and Research	
5.	Evaluation and Management of Risk	
6.	Team Work	
7.	Communication	
8.	Ethics and Responsibility to Society	
9.	Management and Financial	
10.	Practical knowledge and application	

DE5202 CIVIL AND STRUCTURAL DRAWING**Level 5****Credits 15****Version September 2010****LEARNING TIME**

Indicative Directed Hours	Self Directed Hours	Total Hours
90	60	150

RECOMMENDED PRE-REQUISITE

DE4103 Technical Literacy

RECOMMENDED CO-REQUISITE

Nil

AIM/PURPOSE

To develop skills required to produce civil engineering and structural drawings.

LEARNING OUTCOMES

On successful completion of this course, the student should be able to:

1. Produce civil engineering drawings to recognised standards.
2. Produce Structural concrete, steel, and timber drawings to recognised standards.
3. Produce drawings using computer aided draughting (CAD) techniques.

INDICATIVE CONTENT

- Principles of drawing office practice and drawing management
- Topographical survey plans
- Civil engineering construction drawings for roads and water/waste reticulation, long- and cross sections; volume calculations
- Subdivision development layout drawings
- Structural concrete, steel and timber drawings

ASSESSMENT

Assessment Type	Weighting	Outcomes Assessed
Portfolio of Drawings of which at least 50% must be produced in CAD format	100%	1, 2, 3

LEARNING AND TEACHING STRATEGIES

As appropriate to the discipline and to the practice and resources of the delivering Institution. Typically a blend of the following:

Lectures

Formative assessments

Visiting guest lecturers

Web technologies

Computer simulation

Videos

Drawing and CAD Laboratory

IPENZ TECHNICIAN ATTRIBUTES

	IPENZ GRADUATE ATTRIBUTES	OUTCOME
1.	Knowledge of Engineering Sciences	1, 2, 3
2.	Analysis and Problem Solving	
3.	Design and Synthesis	
4.	Investigation and Research	
5.	Evaluation and Management of Risk	
6.	Team Work	
7.	Communication	1, 2, 3
8.	Ethics and Responsibility to Society	
9.	Management and Financial	
10.	Practical knowledge and application	

DE5203 HYDRAULICS (CIVIL)**Level 5****Credits 15****Version September 2010****LEARNING TIME**

Indicative Directed Hours	Self Directed Hours	Total Hours
90	60	150

RECOMMENDED PRE-REQUISITE

Nil

RECOMMENDED CO-REQUISITE

DE4101 Engineering Fundamentals

DE4102 Engineering Mathematics 1

AIM/PURPOSE

To introduce the principles of fluid mechanics and apply them in civil engineering hydraulic applications.

LEARNING OUTCOMES

On successful completion of this course, the student should be able to:

1. Understand and apply the principles of fluid statics and dynamics.
2. Analyse pipelines and pipe networks.
3. Analyse uniform and non-uniform open channel flow.
4. Determine the operating characteristics of pumps in a range of pipeline systems.
5. Demonstrate understanding of the operation and application of a range of equipment used for the measurement of fluid flow in open and closed conduits.

INDICATIVE CONTENT

- Pressure and head, manometers; hydraulic lift (jack); resultant thrust on flat-, inclined and curved surfaces; buoyancy, types of flow (uniform, non-uniform, steady, unsteady), Reynold's number, principle of continuity; fluid energy (Bernoulli), momentum principle, thrust on bends and reducers; overview of water and waste water systems.
- Major and minor losses, Single pipe analyses, pipes in parallel and series, pipe network analysis, computer applications, practical aspects of pipe system design.
- Manning's formula, best channel sections, circular conduits, specific energy, critical depth, sub- and super critical flow, Froude number, flow profiles, practical aspects of channel system design.

- Pump types and applications, turbine types and applications, operating characteristics of centrifugal pumps, pump system optimisation, series vs parallel pumps, variable speed pumps, NPSH.
- Sharp- and broad crested weirs, flumes, flow orifices, flow nozzles, flow meters and gauges (magnetic flow meters, etc)

ASSESSMENT

Assessment Type	Weighting	Outcomes Assessed
Assignments/Projects	35%	1, 2, 3, 4, 5
Tests	15%	1, 2, 3, 4
Examination	50%	1, 2, 3, 4, 5

LEARNING AND TEACHING STRATEGIES

As appropriate to the discipline and to the practice and resources of the delivering Institution. Typically a blend of the following:

Lectures

Tutorials

Formative assessments

Visiting guest lecturers

Web technologies

Computer simulation

Videos

Laboratories

IPENZ TECHNICIAN ATTRIBUTES

	IPENZ GRADUATE ATTRIBUTES	OUTCOME
1.	Knowledge of Engineering Sciences	1, 2, 3, 4, 5
2.	Analysis and Problem Solving	2, 3, 4
3.	Design and Synthesis	
4.	Investigation and Research	
5.	Evaluation and Management of Risk	
6.	Team Work	
7.	Communication	
8.	Ethics and Responsibility to Society	
9.	Management and Financial	
10.	Practical knowledge and application	

DE5204 HIGHWAY ENGINEERING 1**Level 5****Credits 15****Version September 2010****LEARNING TIME**

Indicative Directed Hours	Self Directed Hours	Total Hours
90	60	150

RECOMMENDED PRE-REQUISITE

Nil

RECOMMENDED CO-REQUISITE

Nil

AIM/PURPOSE

To introduce the fundamentals of road materials, road construction practices and road maintenance techniques, as well as the principles of drainage design.

LEARNING OUTCOMES

On successful completion of this course, the student should be able to:

1. Outline and describe road infrastructure administration agencies, road transportation funding mechanisms and principles of route location.
2. Evaluate the properties and testing of road earthworks, pavement and wearing surface materials and demonstrate knowledge of road construction practice.
3. Demonstrate an understanding of the components, functions and design of surface and sub-surface drainage for roads.
4. Evaluate road maintenance solutions/techniques and develop a simple road maintenance strategy.

INDICATIVE CONTENT

- Overview of road infrastructure in NZ, State highways vs local roads, role and responsibilities of roading agencies in NZ, funding sources and mechanisms, principles of route location
- Site establishment, road formation terminology, earthworks materials and - construction practice, sub grade preparation, sub grade improvement, pavement types and components, pavement materials and construction practice, Wearing surface types, wearing surface materials and construction practice
- Surface run-off determination, surface and sub-surface drainage components and installation, culverts, environmental impact of storm water run-off from roads and construction sites

- Modes of surface and pavement distress, failure modes, road condition monitoring, maintenance methods and strategies, life cycle, rehabilitation options, temporary traffic management requirements, safety

ASSESSMENT

Assessment Type	Weighting	Outcomes Assessed
Assignment/Projects	40%	1, 2, 3, 4
Tests	10%	1, 2, 3, 4
Examination	50%	1, 2, 3, 4

LEARNING AND TEACHING STRATEGIES

As appropriate to the discipline and to the practice and resources of the delivering Institution. Typically a blend of the following:

Lectures

Tutorials

Formative assessments

Web technologies

Laboratories

Visiting guest lecturers

Videos

IPENZ TECHNICIAN ATTRIBUTES

	IPENZ GRADUATE ATTRIBUTES	OUTCOME
1.	Knowledge of Engineering Sciences	1, 2
2.	Analysis and Problem Solving	3
3.	Design and Synthesis	4
4.	Investigation and Research	
5.	Evaluation and Management of Risk	3
6.	Team Work	
7.	Communication	
8.	Ethics and Responsibility to Society	3
9.	Management and Financial	
10.	Practical knowledge and application	

DE5205 ENGINEERING SURVEYING**Level 5****Credits 15****Version September 2010****LEARNING TIME**

Indicative Directed Hours	Self Directed Hours	Total Hours
90	60	150

RECOMMENDED PRE-REQUISITE

DE4202 Land Surveying 1

RECOMMENDED CO-REQUISITE

Nil

AIM/PURPOSE

To develop further knowledge and understanding of surveying with specific reference to engineering applications.

LEARNING OUTCOMES

On successful completion of this course, the student should be able to:

1. Execute survey computations and assess errors, accuracy and probability of survey data.
2. Demonstrate understanding of survey specialisation and methods.
3. Undertake a range of site and engineering surveying tasks.
4. Appraise safety requirements in surveying.

INDICATIVE CONTENT

- Survey computations and co-ordinate manipulation, horizontal and vertical curves computations, area and volume quantities, types of errors, accuracy and probability analysis, computer applications
- Robotic- and reflectorless total station, hydrographics, photogrammetry, GIS, GPS, cadastral surveys, introduction to subdivision surveys
- Site survey controls, contours, special topographical surveys, set out of road works and buildings, survey mark protection, as built surveys, CTV, Certification
- Safety on site, Generic TMP, Safety plans

ASSESSMENT

Assessment Type	Weighting	Outcomes Assessed
Assignments/Practicals	40%	1, 2, 3, 4
Tests	10%	1, 2, 3, 4
Examination	50%	1, 2, 3, 4

LEARNING AND TEACHING STRATEGIES

As appropriate to the discipline and to the practice and resources of the delivering Institution. Typically a blend of the following:

Lectures

Tutorials

Formative assessments

Visiting guest lecturers

Web technologies

Computer simulation

Videos

Practicals

Group work

IPENZ TECHNICIAN ATTRIBUTES

	IPENZ GRADUATE ATTRIBUTES	OUTCOME
1.	Knowledge of Engineering Sciences	1, 2, 3, 4
2.	Analysis and Problem Solving	
3.	Design and Synthesis	
4.	Investigation and Research	
5.	Evaluation and Management of Risk	
6.	Team Work	3
7.	Communication	
8.	Ethics and Responsibility to Society	4
9.	Management and Financial	
10.	Practical knowledge and application	3

DE5206 STRUCTURES 2**Level 5****Credits 15****Version September 2010****LEARNING TIME**

Indicative Directed Hours	Self Directed Hours	Total Hours
90	60	150

RECOMMENDED PRE-REQUISITE

DE5201 Structures 1

RECOMMENDED CO-REQUISITE

DE4102 Engineering Mathematics 1

AIM/PURPOSE

To develop further knowledge of structural analysis and structural design.

LEARNING OUTCOMES

On successful completion of this course, the student should be able to:

1. Analyse a range of statically determinate and indeterminate structures and structural elements.
2. Appraise and evaluate the effects of a range of loads (actions) on structures.
3. Design a range of simple structural elements.

INDICATIVE CONTENT

- Statically determinate portal frames, statically indeterminate beams, beam deflections (moment area or Macaulay), computer applications
- Wind and earthquake actions; load resisting mechanisms
- Design reinforced concrete beams, timber column design for combined axial load and bending, steel column design for combined axial loads

ASSESSMENT

Assessment Type	Weighting	Outcomes Assessed
Assignments/Projects	40%	1, 2, 3
Tests	10%	1, 3
Examination	50%	1, 2, 3

LEARNING AND TEACHING STRATEGIES

As appropriate to the discipline and to the practice and resources of the delivering Institution. Typically a blend of the following:

Lectures

Tutorials

Formative assessments

Visiting guest lecturers

Web technologies

Computer simulation and applications

Videos

IPENZ TECHNICIAN ATTRIBUTES

	IPENZ GRADUATE ATTRIBUTES	OUTCOME
1.	Knowledge of Engineering Sciences	1, 2, 3
2.	Analysis and Problem Solving	1, 2, 3
3.	Design and Synthesis	3
4.	Investigation and Research	
5.	Evaluation and Management of Risk	2, 3
6.	Team Work	
7.	Communication	
8.	Ethics and Responsibility to Society	
9.	Management and Financial	
10.	Practical knowledge and application	

DE5207 GEOTECHNICAL ENGINEERING 1**Level 5****Credits 15****Version September 2010****LEARNING TIME**

Indicative Directed Hours	Self Directed Hours	Total Hours
90	60	150

RECOMMENDED PRE-REQUISITE

Nil

RECOMMENDED CO-REQUISITE

Nil

AIM/PURPOSE

To introduce the fundamentals of soil composition, the engineering properties of soils, and site investigation procedures.

LEARNING OUTCOMES

On successful completion of this course, the student should be able to:

1. Describe soil composition and calculate soil phase ratios
2. Determine basic engineering properties of soils
3. Classify soils in the field and from laboratory results
4. Describe and evaluate methods to improve the engineering properties of soils
5. Plan geotechnical site investigations and interpret the results

INDICATIVE CONTENT

- Soil composition,
- Soil tests: grading analysis, plasticity characteristics (LL, PL, PI, CPL, SL), compaction
- Soil classification – unified classification system
- Soil compaction and stabilisation, Shear strength of soils, California Bearing Ratio (CBR), Permeability characteristics of soils
- Subsoil investigations, soil description; soil sampling; in-situ testing; safety

ASSESSMENT

Assessment Type	Weighting	Outcomes Assessed
Assignments/Projects	25%	1, 3, 5
Laboratory reports	15%	2, 4
Tests	10%	1, 2, 3, 4, 5
Examination	50%	1, 2, 3, 4, 5

LEARNING AND TEACHING STRATEGIES

As appropriate to the discipline and to the practice and resources of the delivering Institution. Typically a blend of the following:

Lectures

Formative assessments

Visiting guest lecturers

Group work

Web technologies

Tutorials

Videos

Computer simulation

Laboratories/Practicals

IPENZ TECHNICIAN ATTRIBUTES

	IPENZ GRADUATE ATTRIBUTES	OUTCOME
1.	Knowledge of Engineering Sciences	1, 2, 3
2.	Analysis and Problem Solving	5
3.	Design and Synthesis	
4.	Investigation and Research	5
5.	Evaluation and Management of Risk	
6.	Team Work	
7.	Communication	
8.	Ethics and Responsibility to Society	
9.	Management and Financial	
10.	Practical knowledge and application	4, 5

DE5418 ENGINEERING MATHEMATICS 2**Level 5****Credits 15****Version September 2010****LEARNING TIME**

Indicative Directed Hours	Self Directed Hours	Total Hours
75	75	150

RECOMMENDED PRE-REQUISITE

DE4102 Engineering Mathematics 1

RECOMMENDED CO-REQUISITE

Nil

AIM/PURPOSE

To develop an understanding of general mathematical principles and appropriate engineering mathematical skills to solve engineering problems.

LEARNING OUTCOMES

On the successful completion of this course, the student will be able to:

1. Understand and analyse graphs.
2. Manipulate and solve algebraic expressions and equations.
3. Manipulate and apply complex numbers.
4. Use matrices to solve problems
5. Apply differentiation and integration mathematical techniques to solve engineering problems
6. Derivation and solution of differential equations

INDICATIVE CONTENT

- Graphs and trigonometric waves
- Algebraic expressions and equations
- Complex number forms, expressions, and equations
- Logarithms and exponentials
- Trigonometry
- Matrices and simultaneous equations
- Differentiation and integration techniques in an engineering context

- Differential equation techniques in an engineering context

ASSESSMENT

Assessment Type	Weighting	Outcomes Assessed
Collaborative Tutorials	15%	1, 2, 3, 4, 5, 6
Quizzes/Tests	35%	1, 2, 3, 4, 5, 6
Examination	50%	1, 2, 3, 4, 5, 6

To pass this course, the student must achieve a minimum mark of 50% overall.

LEARNING AND TEACHING STRATEGIES

As appropriate to the discipline and to the practice and resources of the delivering Institution. Typically a blend of the following:

Lectures

Tutorials

Formative assessments

Web technologies

Computer simulation

Visiting guest lecturers

Videos

Laboratories

Group work

Project Investigations

IPENZ TECHNICIAN ATTRIBUTES

	IPENZ GRADUATE ATTRIBUTES	OUTCOME
1.	Knowledge of Engineering Sciences	1, 2, 3, 4, 5, 6
2.	Analysis and Problem Solving	4, 5, 6
3.	Design and Synthesis	
4.	Investigation and Research	
5.	Evaluation and Management of Risk	
6.	Team Work	1, 2, 3, 4, 5, 6
7.	Communication	1, 2, 3, 4, 5, 6
8.	Ethics and Responsibility to Society	
9.	Management and Financial	
10.	Practical knowledge and application	

DE6101 ENGINEERING MANAGEMENT**Level 6****Credits 15****Version September 2010****LEARNING TIME**

Indicative Directed Hours	Self Directed Hours	Total Hours
90	60	150

RECOMMENDED PRE-REQUISITE

Nil

RECOMMENDED CO-REQUISITE

Nil

AIM/PURPOSE

To develop the knowledge and skills required to administer and manage projects effectively in a specific discipline of engineering

LEARNING OUTCOMES

On successful completion of this course, the student should be able to:

1. Demonstrate an understanding of, and apply, the fundamentals of project planning and project management.
2. Prepare and evaluate cost estimates, tender documentation and contract documentation.
3. Administer and supervise contracts in accordance with the relevant Standards and/or Codes of Practice.
4. Critically evaluate professional practice principles and their application to an engineering environment.

INDICATIVE CONTENT

- Project Management functions, scheduling techniques, Critical path analysis, PERT charts, Gantt charts, uncertainty and Risk management
- Contract law and Documentation, schedules of Quantities, costing and Tendering, time cost/quality balance, contract types, engineering company structures
- Requirements of discipline specific Conditions of Contract (NZS3910), dispute resolution

- Professionalism and Ethics, consultation, Treaty of Waitangi, sustainability, Resource Management Act

ASSESSMENT

Assessment Type	Weighting	Outcomes assessed
Projects/Assignments	50%	1, 2, 3, 4
Examination	50%	1, 2, 3, 4

LEARNING AND TEACHING STRATEGIES

As appropriate to the discipline and to the practice and resources of the delivering Institution. Typically a blend of the following:

Lectures

Tutorials

Formative assessments

Web technologies

Computer simulation

Project investigations

Visiting guest lecturers

Videos

Laboratories

Group work

IPENZ TECHNICIAN ATTRIBUTES

	IPENZ GRADUATE ATTRIBUTES	OUTCOME
1.	Knowledge of Engineering Sciences	1, 2, 3, 4
2.	Analysis and Problem Solving	
3.	Design and Synthesis	
4.	Investigation and Research	
5.	Evaluation and Management of Risk	3
6.	Team Work	1, 3
7.	Communication	1
8.	Ethics and Responsibility to Society	4
9.	Management and Financial	1, 2
10.	Practical knowledge and application	

DE6201 GEOTECHNICAL ENGINEERING 2**Level 6****Credits 15****Version September 2010****LEARNING TIME**

Indicative Directed Hours	Self Directed Hours	Total Hours
90	60	150

RECOMMENDED PRE-REQUISITE

DE5207 Geotechnical Engineering 1

RECOMMENDED CO-REQUISITE

Nil

AIM/PURPOSE

To develop further knowledge of the principles and practice of geotechnical engineering.

LEARNING OUTCOMES

On successful completion of this course, the student should be able to:

1. Examine the occurrence and flow of water through soils and discuss the impact soil water has in engineering practice.
2. Determine and evaluate the shear strength parameters of soils.
3. Determine the earth pressure on, and analyse the stability of, earth retaining structures.
4. Analyse the stability of earth slopes.
5. Determine the bearing capacity of shallow and deep foundations.
6. Understand the process of consolidation and estimate consolidation settlement.

INDICATIVE CONTENT

- Darcy's Law; Co-efficient of permeability; Effective stress; Flow nets, Wick drains
- Coulomb's law; Shear box; Tri-axial compression
- Types of retaining structures; Rankine's method; Stability Analysis
- Stability of cohesive- and non-cohesive slopes; Stability curves, computer simulations, geotechnical monitoring and instrumentation
- Terzaghi's equation; bearing capacity coefficient; shape factors; safety factors; Piles
- Stress at depth; Consolidation test results; Coefficient of volume change/Compression index

ASSESSMENT

Assessment Type	Weighting	Outcomes Assessed
Assignments/Projects	30%	3, 4, 5, 6
Laboratory reports	10%	1, 2
Tests	10%	1, 2, 3, 4, 5, 6
Examination	50%	1, 2, 3, 4, 5, 6

LEARNING AND TEACHING STRATEGIES

As appropriate to the discipline and to the practice and resources of the delivering Institution. Typically a blend of the following:

Lectures

Tutorials

Formative assessments

Visiting guest lecturers

Web technologies

Computer simulation

Videos

Laboratories/Practicals

IPENZ TECHNICIAN ATTRIBUTES

	IPENZ GRADUATE ATTRIBUTES	OUTCOME
1.	Knowledge of Engineering Sciences	1, 2, 3, 4, 5, 6
2.	Analysis and Problem Solving	3, 4, 5
3.	Design and Synthesis	
4.	Investigation and Research	
5.	Evaluation and Management of Risk	
6.	Team Work	
7.	Communication	
8.	Ethics and Responsibility to Society	
9.	Management and Financial	
10.	Practical knowledge and application	2, 3, 5

DE6202 HIGHWAY ENGINEERING 2**Level 6****Credits 15****Version September 2010****LEARNING TIME**

Indicative Directed Hours	Self Directed Hours	Total Hours
90	60	150

RECOMMENDED PRE-REQUISITE

DE5204 Highway Engineering 1

RECOMMENDED CO-REQUISITE

Nil

AIM/PURPOSE

To develop knowledge of road design, roading project evaluations and maintenance management.

LEARNING OUTCOMES

On successful completion of this course, the student should be able to:

- 1 Evaluate the feasibility of roading projects.
- 2 Design the geometrical and structural components of a road.
- 3 Demonstrate understanding and knowledge of asset management and road maintenance management fundamentals.

INDICATIVE CONTENT

- Benefit cost ratio, projects costs, project benefits, time value of money, project evaluations
- Characteristics and applications of a range of wearing surfaces, design of sprayed seal surfaces, flexible pavement design using standard design charts, introduction to mechanistic analysis, road geometrics, horizontal alignment, transition curves, vertical alignment, ancillary services (safety rails, pavement marking, signage, street lighting)
- Asset management fundamentals, road performance data acquisition and analysis, life cycle costing, maintenance management strategies

ASSESSMENT

Assessment Type	Weighting	Outcomes Assessed
Assignment/Projects	40%	1, 2, 3
Tests	10%	1, 2, 3
Examination	50%	1, 2, 3

LEARNING AND TEACHING STRATEGIES

As appropriate to the discipline and to the practice and resources of the delivering Institution. Typically a blend of the following:

Lectures

Tutorials

Formative assessments

Visiting guest lecturers

Web technologies

Computer simulation

Videos

Project investigations

IPENZ TECHNICIAN ATTRIBUTES

	IPENZ GRADUATE ATTRIBUTES	OUTCOME
1.	Knowledge of Engineering Sciences	1, 2, 3
2.	Analysis and Problem Solving	1, 2, 3
3.	Design and Synthesis	2
4.	Investigation and Research	
5.	Evaluation and Management of Risk	2, 3
6.	Team Work	
7.	Communication	
8.	Ethics and Responsibility to Society	2
9.	Management and Financial	1, 3
10.	Practical knowledge and application	

DE6203 TRAFFIC ENGINEERING**Level 6****Credits 15****Version September 2010****LEARNING TIME**

Indicative Directed Hours	Self Directed Hours	Total Hours
90	60	150

RECOMMENDED PRE-REQUISITE

Nil

RECOMMENDED CO-REQUISITE

DE4102 Engineering Mathematics 1

AIM/PURPOSE

To introduce traffic engineering concepts and fundamentals.

LEARNING OUTCOMES

On successful completion of this course, the student should be able to:

- 1 Plan and evaluate a range of traffic surveys.
- 2 Understand and apply the principles of traffic flow theory and traffic management.
- 3 Demonstrate knowledge of intersection design fundamentals, and design at-grade intersections.
- 4 Evaluate and apply road safety analysis principles and procedures.
- 5 Understand and appraise the design factors relating to traffic facilities for non-vehicle road users.

INDICATIVE CONTENT

- Traffic growth and traffic forecasts, traffic surveys
- Levels of service, road capacity, traffic flow characteristics and modelling, road hierarchy, access and movement functions, traffic impact assessment, Traffic calming, parking facilities
- Intersection design fundamentals and practice, at grade intersection design
- Accident prevention and reduction, accident investigation procedures and analyses, road safety audits
- Types and characteristics of non-vehicle road users, methods to reduce passenger vehicle road usage, sustainable transport modes, alternatives to roading, advantages and disadvantages resulting from a decrease in vehicle usage

ASSESSMENT

Assessment Type	Weighting	Outcomes Assessed
Assignment/Projects	40%	1, 3, 4, 5
Tests	10%	1, 2
Examination	50%	1, 2, 3, 4, 5

LEARNING AND TEACHING STRATEGIES

As appropriate to the discipline and to the practice and resources of the delivering Institution. Typically a blend of the following:

Lectures

Tutorials

Formative assessments

Visiting guest lecturers

Group work

Web technologies

Computer simulation

Videos

Project investigations

IPENZ TECHNICIAN ATTRIBUTES

	IPENZ GRADUATE ATTRIBUTES	OUTCOME
1.	Knowledge of Engineering Sciences	1, 2, 3, 4
2.	Analysis and Problem Solving	2, 4
3.	Design and Synthesis	3
4.	Investigation and Research	
5.	Evaluation and Management of Risk	4
6.	Team Work	
7.	Communication	
8.	Ethics and Responsibility to Society	4
9.	Management and Financial	
10.	Practical knowledge and application	

DE6204 STRUCTURES 3**Level 6****Credits 15****Version September 2010****LEARNING TIME**

Indicative Directed Hours	Self Directed Hours	Total Hours
90	60	150

RECOMMENDED PRE-REQUISITE

DE5206 Structures 2

RECOMMENDED CO-REQUISITE

Nil

AIM/PURPOSE

To develop analytical and evaluation skills for use in structural analysis and design.

LEARNING OUTCOMES

On successful completion of this course, the student should be able to:

1. Analyse a range of statically indeterminate structures.
2. Appraise and evaluate the effects of a range of loads (actions) on structures.
3. Design a range of structural elements.

INDICATIVE CONTENT

- Single bay and multi-bay frames, computer applications
- Non-directional wind actions on low rise pitched roof buildings, equivalent static earthquake loads on multi-storey structures
- Design pre-stressed concrete beams (Rectangular, T-beams and I-beams), design reinforced concrete beams and columns, design steel work connections

ASSESSMENT

Assessment Type	Weighting	Outcomes Assessed
Assignments/Projects	100%	1, 2, 3

LEARNING AND TEACHING STRATEGIES

As appropriate to the discipline and to the practice and resources of the delivering Institution. Typically a blend of the following:

*Lectures**Tutorials**Formative assessments**Visiting guest lecturers**Web technologies**Computer applications**Videos**Project investigations***IPENZ TECHNICIAN ATTRIBUTES**

	IPENZ GRADUATE ATTRIBUTES	OUTCOME
1.	Knowledge of Engineering Sciences	1, 2, 3
2.	Analysis and Problem Solving	1
3.	Design and Synthesis	3
4.	Investigation and Research	
5.	Evaluation and Management of Risk	2, 3
6.	Team Work	
7.	Communication	
8.	Ethics and Responsibility to Society	
9.	Management and Financial	
10.	Practical knowledge and application	

DE6205 WATER AND WASTEWATER SYSTEMS**Level 6****Credits 15****Version September 2010****LEARNING TIME**

Indicative Directed Hours	Self Directed Hours	Total Hours
90	60	150

RECOMMENDED PRE-REQUISITE

DE5203 Hydraulics (Civil)

RECOMMENDED CO-REQUISITE

Nil

AIM/PURPOSE

To evaluate the requirements of, and design water, waste water and storm water reticulation systems.

LEARNING OUTCOMES

On successful completion of this course, the student should be able to:

1. Analyse water supply and demand requirements, and design a small water reticulation system.
2. Evaluate hydrological parameters and design an urban storm water management system.
3. Determine waste water quantities and design a waste water reticulation system.
4. Appraise the requirements of water and waste water pumping installations and optimise design.
5. Understand integrated water management approaches.

INDICATIVE CONTENT

- Water supply sources; Water demand; Water reticulation system components; Water reticulation analysis; Reticulation installation and maintenance; Water reservoirs.
- Hydrological cycle; Surface run-off determination; Infiltration; Storm water reticulation components and design; Storm water buffering; Storm water disposal; Impact of storm water run-off.

- Waste water sources and quantities; Waste water collection and reticulation system components design and maintenance.
- More efficient use of water, water metering, recycled water.
- Pump station layout and components; Variable capacity requirements; Sump capacity Series, parallel and variable pump operation; Pump system (sump, pump and rising main) optimisation.

ASSESSMENT

Assessment Type	Weighting	Outcomes Assessed
Assignments/Projects	40%	1, 2, 3, 4, 5
Tests	10%	1, 2, 3, 4
Examination	50%	1, 2, 3, 4, 5

LEARNING AND TEACHING STRATEGIES

As appropriate to the discipline and to the practice and resources of the delivering Institution. Typically a blend of the following:

Lectures

Tutorials

Formative assessments

Visiting guest lecturers

Web technologies

Computer simulation

Videos

Project investigations

Field trips

IPENZ TECHNICIAN ATTRIBUTES

	IPENZ GRADUATE ATTRIBUTES	OUTCOME
1.	Knowledge of Engineering Sciences	1, 2, 3, 4
2.	Analysis and Problem Solving	1, 2, 3, 4
3.	Design and Synthesis	1, 2, 3, 4
4.	Investigation and Research	
5.	Evaluation and Management of Risk	1, 2, 3
6.	Team Work	
7.	Communication	
8.	Ethics and Responsibility to Society	
9.	Management and Financial	
10.	Practical knowledge and application	

DE6206 WATER AND WASTE MANAGEMENT**Level 6****Credits 15****Version September 2010****LEARNING TIME**

Indicative Directed Hours	Self Directed Hours	Total Hours
90	60	150

RECOMMENDED PRE-REQUISITE

Nil

RECOMMENDED CO-REQUISITE

Nil

AIM/PURPOSE

To develop knowledge and understanding of drinking water quality control parameters and treatment methods, and of current and emerging treatment technologies for liquid and solid wastes.

LEARNING OUTCOMES

On successful completion of this course, the student should be able to:

1. Evaluate and apply drinking water standards and quality parameters.
2. Understand and appraise the principles and practice of water treatment.
3. Evaluate and apply waste water quality parameters.
4. Demonstrate knowledge of wastewater- and solid waste treatment and disposal methods.
5. Critically evaluate environmental impact and Maori cultural values in relation to water supply and waste management.

INDICATIVE CONTENT

- Drinking water characteristics; quality parameters, Drinking water standards; public health and safety.
- Water treatment components and processes.
- Waste water sources, waste water characteristics, quality parameters.
- Centralised waste water treatment system components and processes, decentralised waste water treatment systems, septic tanks, recirculation sand filters, oxidation ponds, advance pond systems, wetlands, evapo-transpiration beds, spray irrigation, etc.
- Nature, quantities and methods of solid waste disposal.

- Environmental impact studies, Cultural attitudes and perspectives on water and waste water management.

ASSESSMENT

Assessment Type	Weighting	Outcomes Assessed
Project and Presentations	40%	2, 4, 5
Tests	10%	1, 3
Examination	50%	1, 2, 3, 4

LEARNING AND TEACHING STRATEGIES

As appropriate to the discipline and to the practice and resources of the delivering Institution. Typically a blend of the following

Lectures

Tutorials

Formative assessments

Visiting guest lecturers

Web technologies

Computer simulation

Videos

Project investigations

Field trips

IPENZ TECHNICIAN ATTRIBUTES

	IPENZ GRADUATE ATTRIBUTES	OUTCOME
1.	Knowledge of Engineering Sciences	1, 2, 3, 4
2.	Analysis and Problem Solving	
3.	Design and Synthesis	
4.	Investigation and Research	1, 2, 3, 4
5.	Evaluation and Management of Risk	1, 2, 3, 4
6.	Team Work	
7.	Communication	
8.	Ethics and Responsibility to Society	5
9.	Management and Financial	
10.	Practical knowledge and application	

DE6299 ENGINEERING PROJECT (CIVIL)**Level 6****Credits 15****Version September 2010****LEARNING TIME**

Indicative Directed Hours	Self Directed Hours	Total Hours
40	110	150

RECOMMENDED PRE-REQUISITES

DE4103 Technical Literacy

DE4201 Materials (Civil)

DE5207 Geotechnical Engineering 1

RECOMMENDED CO-REQUISITE

Nil

AIM/PURPOSE

To integrate and synthesise civil engineering knowledge in one or more project based learning experiences.

LEARNING OUTCOMES

On successful completion of this course, the student should be able to:

1. Develop a preliminary design, based on sound engineering practice, for a civil engineering construction project.
2. Undertake well-defined planning of construction work in a civil engineering environment.
3. Evaluate compliance of the project to specification.
4. Present findings to an audience in a professional manner.

INDICATIVE CONTENT

- Research options for planning and construction to meet specifications of a selected civil engineering project.
- Identification and application of relevant standards basic design commissioning methodology, detailed plan, safety requirements, environmental impact.
- A written structured report that includes executive summary, aim, background, preliminary design calculation, drawings and specification, discussion, references.
- Presentation of an overview of the project to peers and/or industry representatives.

ASSESSMENT

Assessment Type	Weighting	Outcomes Assessed
Projects and presentations	100%	1

LEARNING AND TEACHING STRATEGIES

As appropriate to the discipline and to the practice and resources of the delivering Institution. Typically a blend of the following:

Lectures

Videos

Web technologies

Computer simulation

Project investigations

Visiting guest lecturers

Presentation

Group work

IPENZ TECHNICIAN ATTRIBUTES

	IPENZ GRADUATE ATTRIBUTES	OUTCOME
1.	Knowledge of Engineering Sciences	
2.	Analysis and Problem Solving	1, 2, 3, 4
3.	Design and Synthesis	1, 2, 3
4.	Investigation and Research	1, 2, 3, 4
5.	Evaluation and Management of Risk	1, 2, 3, 4
6.	Team Work	
7.	Communication	1, 2, 3, 4
8.	Ethics and Responsibility to Society	1, 2, 3, 4
9.	Management and Financial	
10.	Practical knowledge and application	1, 2, 3, 4