

PROGRAMME CODE:	PROGRAMME TITLE:
TK0222	NZ Diploma in Engineering (Civil)
Course Descriptor	



COURSE CODE:	COURSE TITLE:
DCE3.358	MECHANICS

WITT credit value: 12
Level: 3 Compulsory
Duration: 20 weeks
Internet based learning indicator: 2 - Web Supported

Learning hours:

Tutor contact hours	48
Self-directed hours	72
Total learning hours	120

Purpose:

To introduce the basic concepts of mechanics (applied physics) and cover the key areas of knowledge necessary for students to be competent in the solution of problems combining information from different parts of the course.

Prerequisites:

Nil - (unless specified in a "prescribed course of study" set as part of programme entry requirements)

Recommendations:

Success in Mechanics generally requires students to have a good level of competence in mathematics at NCEA Level 2 standard. It is recommended that students do a refresher course/s to ensure they have current competence to achieve at this skill level.

Learning outcomes:

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

NO	LEARNING OUTCOME
1.	Solve simple force systems. 1.1 Explain the difference between scalar and vector quantities. 1.2 Describe properties of vectors in general and forces in particular. 1.3 Calculate the properties of a force. 1.4 Explain the moment of a force. 1.5 Describe basic types of force system (coplanar, concurrent, etc.) 1.6 State the conditions of static equilibrium. 1.7 Use graphical and mathematical methods to solve problems.
2.	Calculate positions of centroids and centres of gravity 2.1 Describe centre of gravity and centroid. 2.2 Explain first moment of area. 2.3 Use experimental and first moment of area methods.
3.	Describe relevant material properties. 3.1 Define stress, strain and modulus of elasticity. 3.2 Solve simple stress, strain and modulus of elasticity problems.

4.	Calculate shear and bending moment values. 4.1 Define shear force and bending moment. 4.2 Use shear force and bending moment diagram sign convention. 4.3 Plot simple SFD and BMD – plot loads and moments as loads.
5.	Apply equations of linear motion (constant acceleration). 5.1 Demonstrate derivation of equations. 5.2 Define relative velocity. 5.3 Solve simple problems. 5.4 Solve problems involving trajectories of projectiles.
6.	Solve simple problems involving work and energy. 6.1 Define work and types of energy. 6.2 State principle of conservation of energy. 6.3 Apply these concepts to solution of simple problems.
7.	Solve simple problems involving friction. 7.1 Define static and dynamic friction and coefficient of friction. 7.2 Solve simple problems involving friction.
8.	Solve problems involving forces and motions. 8.1 State Newton's three laws of motion. 8.2 Define momentum and solve simple problems.

Content/main topics:

Forces, moments, centre of gravity, centroids, material properties, shear forces, bending moments, linear motion, work done, energy, friction, forces and motion.

Basis of assessment:

All assessments in this course are achievement based. The Final Overall Mark will be the sum of the Coursework Mark and the Examination Mark as detailed below.

The Coursework Mark is the weighted sum of the test, assignment, project, etc, marks. Course Information sheets (issued at the start of each course) will detail the individual weightings and coverage of each assessment task and end of term examination.

Assessment requirements:

Component	Assessment Task	Coursework Mark %	Overall Weighting
Coursework	Controlled Assessments (e.g. Tests)	50%	50%
	Uncontrolled Tasks (Assignments, Project, etc)	50%	
	Total Coursework Mark	100%	
	(To pass you must achieve a Coursework Mark of at least 40%)		
Examination	Total Examination Mark	100%	50%
	(To pass you must achieve an Examination Mark of at least 40%)		
Overall Course	(To pass you must achieve a Final Overall Mark of at least 50%)		100%

Required texts:

None. Printed course notes are provided.

Recommended reading:

School of Engineering (2000) *Mechanics 2*. NZ: Auckland University of Technology
 Ivanoff, V. (1996). *Engineering Mechanics*. Sydney, Australia: McGraw-Hill Book
 Hannah, J. & Hillier, M.J. (1996) *Applied Mechanics* (3rd ed.). U.K: Longman Scientific & Technical Publishers.

Course Descriptor**WITT credit value:** 9**Level:** 4 Compulsory**Duration:** 20 weeks**Internet based learning indicator:** 2 - Web Supported**Learning hours:**

Tutor contact hours	60
Self-directed hours	30
Total learning hours	90

Rationale for allocation of hours:

Extra contact hours have been allocated to this course to help improve student achievement in what historically has proven to be a difficult subject.

Purpose:

To enable students to use key mathematical skills, concepts and understanding in the areas of algebra, trigonometry and complex numbers; to solve engineering problems. To develop personal and interpersonal communications skills in an engineering context.

Prerequisites:

Nil - (unless specified in a "prescribed course of study" set as part of programme entry requirements)

Recommendations:

Success in Level 4 Mathematics requires students to have a good level of competence in mathematics to at least NCEA Level 2 standard. It is recommended that students do a refresher course/s to ensure they have current competence to achieve at this skill level.

Learning outcomes:

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

NO	LEARNING OUTCOME
1.	Demonstrate a knowledge of basic algebraic skills <ul style="list-style-type: none"> 1.1 Expansion and factorisation 1.2 Algebraic fractions 1.3 Exponents and logarithms 1.4 Simple manipulation of surds 1.5 Linear equations 1.6 Remainder and factor theorem
2.	Use correct notation and terminology of functions when exploring practical Civil Engineering examples <ul style="list-style-type: none"> 2.1 Interpret graphs of engineering data (linear and non-linear). 2.2 Draw graphs of: linear functions, polynomial functions, simple conics centred on the origin, exponential functions, logarithmic functions and simple rational functions.

	<p>2.3 Use the relationships for transforming logarithmic to exponential and exponential to logarithmic forms</p> <p>2.4 Apply exponential functions to simple problems including rates of growth and decay</p>
3.	<p>Demonstrate a knowledge of techniques of trigonometry using both degree and radian measures</p> <p>3.1 Understand degree and radian measure</p> <p>3.2 Define amplitude, frequency and period of a graph, and graph trigonometric functions of the form $y = k \sin(\omega t + \alpha)$</p> <p>3.3 Solve trigonometric equations including the type $k \sin(\omega t + \alpha) = a$</p> <p>3.4 Review trigonometric identities</p> <p>3.5 Use double angle formulae</p>
4.	<p>Sketch simple combinations of functions</p> <p>4.1 Sketch graphs involving the addition of simple trigonometric functions</p>
5.	<p>Use the Binomial Theorem</p> <p>5.1 Expand and simplify a binomial using the binomial theorem for any exponent</p>
6.	<p>Use complex numbers</p> <p>6.1 Define the complex number j</p> <p>6.2 Perform the four main numerical operations in Cartesian form</p> <p>6.3 Explain the importance of complex numbers in real problems</p>
7.	<p>Apply appropriate techniques to solve equations</p> <p>7.1 Solve simultaneous equations (up to two unknowns with one equation being non linear)</p> <p>7.2 Solve quadratic equations by factorisation and formula</p> <p>7.3 Solve indicial and logarithmic equations</p> <p>7.4 Apply the above techniques to word problems</p>
8.	<p>Derive an appropriate function to fit a given data set</p> <p>8.1 Construct suitable transformations to change a function to linear form</p> <p>8.2 Graph a linearised function to determine unknown coefficients</p>
9.	<p>Apply correlation and simple regression techniques to data, making interpretations and predictions based on these calculations</p> <p>9.1 Represent the data on a scatter diagram</p> <p>9.2 Establish the regression equation, both manually and by using a calculator</p> <p>9.3 Determine the correlation coefficient, and use it to predict results</p>
10.	<p>Demonstrate personal and interpersonal communication skills in model workplace environments</p> <p>10.1 Communicate mathematical ideas to a group</p> <p>10.2 Communicate effectively in an inter-cultural situation</p> <p>10.3 Speak effectively to a group</p>

Content/main topics:

Basic algebra, terminology, graphing basic functions, polynomial functions, simple conics, exponential functions, rational functions, log functions, growth and decay rates, trigonometry, trigonometric identities, simultaneous equations, quadratic equations, logarithmic equations, fitting functions to data, complex numbers, regression techniques.

Basis of assessment:

All assessments in this course are achievement based. The Final Overall Mark will be the sum of the Coursework Mark and the Examination Mark as detailed below.

The Coursework Mark is the weighted sum of the test, assignment, project, etc, marks. Course Information sheets (issued at the start of each course) will detail the individual weightings and coverage of each assessment task and end of term examination.

Assessment requirements:

Component	Assessment Task	Coursework Mark %	Overall Weighting
Coursework	Controlled Assessments (e.g. Tests)	50%	50%
	Uncontrolled Tasks (Assignments, Project, etc)	50%	
	Total Coursework Mark	100%	
	(To pass you must achieve a Coursework Mark of at least 40%)		
Examination	Total Examination Mark	100%	50%
	(To pass you must achieve an Examination Mark of at least 40%)		
Overall Course	(To pass you must achieve a Final Overall Mark of at least 50%)		100%

Required texts:

None. Printed course notes are provided

Recommended reading:

Washington, A.J. (1994). *Basic Technical Mathematics* (6th ed.). USA: Addison Wesley.
 Bird, J. (2001). *Engineering Mathematics* (3rd ed.). Oxford: Newnes (Butterworth-Heinemann).
 Silyn-Roberts, H. (2000). *Writing for Science and Engineering*. Oxford: Butterworth-Heinemann.

PROGRAMME CODE:	PROGRAMME TITLE:
TK0222	NZ Diploma in Engineering (Civil)
Course Descriptor	



COURSE CODE:	COURSE TITLE:
DCE4.451	ENGINEERING MATHEMATICS 1B

WITT credit value: 9
Level: 4 Compulsory
Duration: 20 weeks
Internet based learning indicator: 2 - Web Supported

Learning hours:

Tutor contact hours	60
Self-directed hours	30
Total learning hours	90

Rationale for allocation of hours:

Extra contact hours have been allocated to this course to help improve student achievement in what historically has proven to be a difficult subject.

Purpose:

To provide students with the ability to demonstrate mathematical skills, concepts and understandings in calculus. Develop these skills concepts and understandings in order to solve problems.

Prerequisites:

Nil - (unless specified in a "prescribed course of study" set as part of programme entry requirements)

Recommendations:

Success in Level 4 Mathematics requires students to have a good level of competence in mathematics to at least NCEA Level 2 standard. It is recommended that students do a refresher course/s to ensure they have current competence to achieve at this skill level.

Learning outcomes:

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

No	LEARNING OUTCOME
	Differentiate and calculate derivatives
1.	1.1 State the basic concept that $f'(x)$ is the slope of the graph of $f(x)$ at x with the derivative defined by : $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ 1.2 Use the notational forms: $f'(x)$, $\frac{dy}{dx}$, y' , $\frac{d}{dx}$, $f''(x)$, $\frac{d^2y}{dx^2}$ 1.3 Evaluate the derivatives of powers of x , logarithmic and exponential functions 1.4 Calculate the derivative of composite functions by the chain rule 1.5 Calculate the derivative of sums, products and quotients 1.6 Calculate the derivative for implicit relations

	1.7 Calculate the derivative for parametric functions 1.8 Calculate 2 nd derivatives excluding parametric / implicit functions 1.9 Interpret the derivative as a rate of change
2.	Apply differentiation to solve problems 2.1 Find the gradient and the tangent to a curve at a given point 2.2 Determine the max and min values of functions of one independent variable 2.3 Apply optimisation techniques to real problems which may involve more than one variable 2.4 Calculate and interpret rates of change of time dependent variables (e.g. growth and decay rates, speed and acceleration) 2.5 Use the Newton-Raphson method to solve equations
3.	Integrate and calculate definite and indefinite integrals 3.1 Evaluate a definite integral 3.2 Integrate x^n , e^x , $f(ax+b)$ 3.3 Integrate by inspection or substitution $\frac{f'}{f}$, $g(f).f'$ 3.4 Integrate by parts (e.g. $x.e^{3x}$)
4.	Solve problems using integration 4.1 Evaluate definite integrals 4.2 Formulate as definite integrals: (i) areas between curves (ii) mean (iii) r.m.s. (non trigonometric only) (iv) volumes of revolution (v) first and second moments of area 4.3 Use Simpson's rule to determine the value of definite integrals (area and volume problems)
5.	Formulate, solve and use differential equations 5.1 Use differential equations to construct a model of reality 5.2 Explain the difference between general and particular solutions 5.3 Determine the particular solution given a general solution and initial conditions 5.4 Prove that a given function is a solution of a given differential equation 5.5 Find the general solution of a differential equation which may be one of the following forms: $\frac{dy}{dx} = f(x)$ $\frac{dy}{dx} = f(x).g(y) \text{ {separating variables} }$ $\frac{dy}{dx} = ky$ $\frac{d^2y}{dx^2} = f(x)$ 5.6 Interpret the solution of a differential equation in terms of the real situation e.g. growth rates, linear motion, simple harmonic motion

Content/main topics:

Differentiation, powers of x, log & exponential functions, composite functions, sums, products & quotients, implicit relations, parametric functions, second derivatives, optimisation techniques, integration techniques, integration applications, Simpson's rule, growth rates, time dependent variables, linear motion, simple harmonic motion.

Basis of assessment:

All assessments in this course are achievement based. The Final Overall Mark will be the sum of the Coursework Mark and the Examination Mark as detailed below.

The Coursework Mark is the weighted sum of the test, assignment, project, etc, marks. Course Information sheets (issued at the start of each course) will detail the individual weightings and coverage of each assessment task and end of term examination.

Assessment requirements:

Component	Assessment Task	Coursework Mark %	Overall Weighting
Coursework	Controlled Assessments (e.g. Tests)	50%	50%
	Uncontrolled Tasks (Assignments, Project, etc)	50%	
	Total Coursework Mark	100%	
	(To pass you must achieve a Coursework Mark of at least 40%)		
Examination	Total Examination Mark	100%	50%
	(To pass you must achieve an Examination Mark of at least 40%)		
Overall Course	(To pass you must achieve a Final Overall Mark of at least 50%)		100%

Required texts:

None. Printed course notes are provided

Recommended reading:

Kuhfittig, Peter K.F. (1989). *Basic Technical Mathematics with Calculus* (2nd ed). U.S.A.: Brooks/Cole Pub.

PROGRAMME CODE:	PROGRAMME TITLE:
TK0222	NZ Diploma in Engineering (Civil)
Course Descriptor	



COURSE CODE:	COURSE TITLE:
DCE4.452	LAND SURVEYING

WITT credit value: 9
Level: 4 Compulsory
Duration: 20 weeks
Internet based learning indicator: 2 - Web Supported

Learning hours:

Tutor contact hours	36
Self-directed hours	54
Total learning hours	<u>90</u>

Purpose:

To understand the basic theoretical and practical concepts of Land Surveying and demonstrate good health and safety practices in carrying out basic survey work.

Prerequisites:

Nil - (unless specified in a "prescribed course of study" set as part of programme entry requirements)

Recommendations:

Success in Land Surveying requires students to have a good level of competence in mathematics at NCEA Level 2 standard. It is recommended that students do a refresher course/s to ensure they have current competence to achieve at this skill level.

Learning outcomes:

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

NO	LEARNING OUTCOME
1.	Introduce the principles of land surveying <ol style="list-style-type: none"> 1.1 Describe the different types and purposes of surveying, including levelling circuits, control traverses, topographical surveys, contours, roading, cross-sections & setting out procedures. 1.2 Explain the concept of working from the whole to the part. 1.3 Explain the importance of using check procedures in the field so that all measurements can be confirmed. 1.4 Describe orders of accuracy required for classes of work. 1.5 Identify statutory sources of survey information. 1.6 Set-up survey instruments and targets and ensure instruments are set-up in accordance with manufacturers' specifications 1.7 Care and handling of survey instruments in accordance with manufacturers' specifications 1.8 Centre instruments and observing marks over survey marks 1.9 A stable observing platform is provided in accordance with instrument requirements

2.	<p>Determine Vertical Height and Reduced Levels For Survey Purposes</p> <p>2.1 Instrumentation is selected in accordance with job specification Range may include but not limited to: inclinometer, tape, carpenter's level, 2nd & 3rd order automatic optical levels, digital levels, theodolites.</p> <p>2.2 Methodology may include but not limited to: plumbing, differential levelling, trigonometrical levelling</p> <p>2.3 Instruments are calibrated in accordance with manufacturers' specifications</p> <p>2.4 Field observations are undertaken in accordance with job specifications</p> <p>2.5 All determinations are checked in accordance with workplace procedures</p> <p>2.6 Closing errors are calculated and distributed in accordance with job specifications.</p>
3.	<p>Apply Trigonometrical Concepts To Surveying</p> <p>3.1 Elements of two dimensional figures are solved from supplied data in accordance with industry standards</p> <p>3.2 Closure and adjustment of bearings in multi-line traverses is accordance with survey industry standards and job specifications</p> <p>3.3 Slope distances are reduced in accordance with survey industry standards and project specifications.</p> <p>3.4 Field measured bearings and distances are combined to create a closed traverse in accordance with survey industry standards or job specification.</p> <p>3.5 Errors in measurement are recognised and eliminated or measurement repeated.</p> <p>3.6 Mis-closures are adjusted in accordance with survey industry standards.</p> <p>3.7 Co-ordinates are calculated for all marks in a closed traverse and for hanging lines.</p>
4.	<p>Undertake and record angular field measurements for Survey Purposes</p> <p>4.1 Equipment and method of angular measurement are selected in accordance with job specifications</p> <p>4.2 Using survey equipment, undertake direct angular observations</p>
5.	<p>Undertake and Record Linear Field Measurements for Survey Purposes</p> <p>5.1 Equipment and method of linear measurement are selected in accordance with job specifications.</p> <p>5.2 Measurements and field data are recorded in accordance with survey regulations and job specifications: may include but is not limited to the use of field books.</p>
6.	<p>Health & Safety in Surveying</p> <p>6.1 Operate safely whilst conducting a survey</p> <p>6.2 Safety equipment is used in accordance with Health & Safety in Employment Act 1992</p> <p>6.3 Site damage and/or works and accidents are dealt with in accordance with the workplace procedures and the Health & Safety in Employment Act 1992.</p> <p>6.4 Identify & eliminate hazards on a construction site.</p> <p>6.5 Maintain a safe working environment in a survey office.</p>

Content/main topics:

Survey philosophy, survey methods, instrumentation selection and methodology, determine height differences and reduced levels, health and safety, instrument set up, target observation, linear and angular observation and measurement, equipment calibration, record and reduce field observations, trigonometry, bearing and traverse closures, misclosure adjustments, co-ordinates

Basis of assessment:

All assessments in this course are achievement based. The Final Overall Mark will be the sum of the Coursework Mark and the Examination Mark as detailed below.

The Coursework Mark is the weighted sum of the test, assignment, project, etc, marks. Course Information sheets (issued at the start of each course) will detail the individual weightings and coverage of each assessment task and end of term examination.

Assessment requirements:

Component	Assessment Task	Coursework Mark %	Overall Weighting
Coursework	Controlled Assessments (e.g. Tests)	50%	50%
	Uncontrolled Tasks (Assignments, Project, etc)	50%	
	Total Coursework Mark	100%	
	(To pass you must achieve a Coursework Mark of at least 40%)		
Examination	Total Examination Mark	100%	50%
	(To pass you must achieve an Examination Mark of at least 40%)		
Overall Course	(To pass you must achieve a Final Overall Mark of at least 50%)		100%

Required texts:

None. Printed course notes are provided

Recommended reading:

Bannister, A., Raymond, S., Baker, R. (1998), *Surveying* (7th ed.). Harlow U.K.: Longman Scientific and Technical.
 Uren, J., Price, W.F. (1994). *Surveying for Engineers* (3rd ed.). London: MacMillan.
 Wilson, R.J.P. (1983). *Land Surveying* (3rd ed.). Plymouth, U.K.: MacDonald & Evans.
 Schofield, W., (2001). *Engineering Surveying* (5th ed.). Oxford: Butterworth-Heinemann.

PROGRAMME CODE:	PROGRAMME TITLE:
TK0222	NZ Diploma in Engineering (Civil)
Course Descriptor	



COURSE CODE:	COURSE TITLE:
DCE4.454	HYDRAULICS / HYDROLOGY

WITT credit value: 9
Level: 4 Compulsory
Duration: 20 weeks
Internet based learning indicator: 2 - Web Supported

Learning hours:

Tutor contact hours	36
Self-directed hours	54
Total learning hours	90

Purpose:

To provide students with the basic concepts of hydrology, catchment management and hydraulics. To develop understanding of the process and use of data in civil engineering, and to facilitate an ability to design systems to manage and control water resources. To develop personal and interpersonal communications skills in an engineering context.

Prerequisites:

Nil - (unless specified in a "prescribed course of study" set as part of programme entry requirements)

Recommendations:

Success in Hydraulics/Hydrology requires students to have a good level of competence in mathematics at NCEA Level 2 standard. It is recommended that students do a refresher course/s to ensure they have current competence to achieve at this skill level.

Learning outcomes:

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

NO	LEARNING OUTCOME
1.	Identify the factors affecting the hydrological cycle. 1.1 Explain the subject definition, and its application to engineering practice and usage. 1.2 Identify the key processes of the cycle. 1.3 Describe the significance of key process as well as their local, regional and national variations. 1.4 Identify the stochastic nature of these components, their variability and demonstrate how statistical probability is used in design affecting a range of structures. 1.5 Assess the effects of change in variables on a water budget within a hydrological cycle.

No	LEARNING OUTCOME
2.	<p>Identify the different types of weather systems and the characteristics of rainfall.</p> <ul style="list-style-type: none"> 2.1 Describe the main climatic aspects of rainfall type. 2.2 Describe the main characteristics of the weather systems which cause such rainfall. 2.3 Explain the use of weather maps with particular reference to those preceding flood events. 2.4 Describe the significance of rainfall and relationships between components of depth/duration/frequency and recurrence interval. 2.5 Demonstrate the rainfall components using individual stations. 2.6 Describe the significance of drought and flood events as they affect design aspects of bridges, culverts, water supply dams and flood protection systems.
3.	<p>Identify the main factors which define a catchment and the management of its water resources.</p> <ul style="list-style-type: none"> 3.1 Explain the subject definition and its relationship to the use of catchment design aids. 3.2 Identify the key factors that influence surface and sub-surface water flow, including critical elements such as saturated and unsaturated zones. 3.3 Demonstrate the effects of change in the hydrological factors on the water budget within a catchment. 3.4 Describe potential risks to water resources, including pollution scenarios. 3.5 Assess run off with using both TM61 and the Rational Formula 3.6 Describe RFE to a regional river system. 3.7 Describe and plot stage and discharge hydrographs from given data. 3.8 Interpret hydrographs from selected catchment areas which identify a range of characteristics.
4.	<p>Describe the range of flow measuring devices commonly used in rivers and streams including basic water level monitoring, flow velocity measurement, river gauging procedures and flow tabulations.</p> <ul style="list-style-type: none"> 4.1 Describe the main types of current meters in common use. 4.2 Determine flow date from a NZ river using a TIDEDA record. 4.3 Determine mean and median flows from a similar TIDEDA record. 4.4 Describe the velocity – area method used for river and stream flow and evaluate flows from a river section.
5.	<p>Identify the factors affecting static fluid pressure.</p> <ul style="list-style-type: none"> 5.1 Describe the key characteristic of fluids 5.2 Identify the relationship between static head and pressure; gauge and absolute pressures 5.3 Describe the relationship between pressure and force on submerged objects, and the centre of pressure on a vertical rectangular plate.
6.	<p>Identify the factors affecting uniform flow in open channels of regular cross sections.</p> <ul style="list-style-type: none"> 6.1 Apply Manning's equation for flow in rectangular, trapezoidal and circular open channels flowing partly full 6.2 Calculate open channel flow velocity and discharge for various materials, sections, slope and water depth

	6.3 Evaluate water depths as per 6.2 using tabular trial and error methods given slope, section and discharge 6.4 Describe the application of partial element graphs for circular and rectangular conduits flowing partially full to flow calculations
7.	Identify the factors affecting uniform flow in pipes and rectangular conduits including minor and major losses. 7.1 Apply energy principles and Bernoulli's equation to circular pipes. 7.2 Apply the continuity of flow principle to pipes and conduits. 7.3 Describe the application of partial element graphs for circular and rectangular conduits flowing partially full, to flow calculations.
8.	Demonstrate personal and interpersonal skills in model workplace environment. 8.1 Listen effectively and summarise orally the main points made by previous speaker 8.2 Make notes of meetings and/or tutor's talk 8.3 Use word processing and other specialist software packages 8.4 Give oral instructions to accurately undertake a given task 8.5 Write a short logical report.

Content/main topics:

Hydrological cycles, weather patterns, TM61 method, Rational Formula method, climate, geology, slope, land use, ground cover, size and shape of the drainage basin, aquifers - open and confined, the presence of aquifudes, springs, artesian flows, land use, water extraction, erosion, irrigation, point source discharge, fluid pressure, open channel flow, partial element graphs.

Basis of assessment:

All assessments in this course are achievement based. The Final Overall Mark will be the sum of the Coursework Mark and the Examination Mark as detailed below.

The Coursework Mark is the weighted sum of the test, assignment, project, etc, marks. Course Information sheets (issued at the start of each course) will detail the individual weightings and coverage of each assessment task and end of term examination.

Assessment requirements:

Component	Assessment Task	Coursework Mark %	Overall Weighting
Coursework	Controlled Assessments (e.g. Tests)	50%	50%
	Uncontrolled Tasks (Assignments, Project, etc)	50%	
	Total Coursework Mark	100%	
	(To pass you must achieve a Coursework Mark of at least 40%)		
Examination	Total Examination Mark	100%	50%
	(To pass you must achieve an Examination Mark of at least 40%)		
Overall Course	(To pass you must achieve a Final Overall Mark of at least 50%)		100%

Required texts:

None. Printed course notes are provided

Recommended reading:

- Canter, J. & Hessell, J. (1980). The Frequency of High Intensity Rainfalls in New Zealand, Part II Point Estimates. *NZ Meteorological Service* Misc. Pub. 162, Wellington.
- Silyn-Roberts, H. (2000). Writing for Science and Engineering. Oxford: Butterworth-Heinemann
- Masley, M.P. (1992). Waters of New Zealand. *New Zealand Hydrological Society*, p431, Wellington.
- McKercher, A. & Beable, M. (1983). Regional Flood Estimation – A design Procedure. *Water and Soil* Misc. Pub. 57, Wellington.
- McKercher, A. & Pearson, C. (1989). Flood Estimation – A Revised Design Procedure. *IPENZ Transactions*, Vol. 16, No. 2/CE, November, Wellington.
- Shaw, E.M. (1983). *Hydrology in Practice*. Berkshire, U.K.: Van Nostrand Reinhold.
- Toebs, C. (1963). *Hydrology*. Wellington: Correspondence School.

PROGRAMME CODE:	PROGRAMME TITLE:
TK0222	NZ Diploma in Engineering (Civil)
Course Descriptor	



COURSE CODE:	COURSE TITLE:
DCE4.456	GEOTECHNICAL ENGINEERING 1

WITT credit value: 9
Level: 4 Compulsory
Duration: 20 weeks
Internet based learning indicator: 2 - Web Supported

Learning hours:

Tutor contact hours	36
Self-directed hours	54
Total learning hours	90

Purpose:

To develop an ability to describe and classify soils and to determine engineering properties of a soils by field and laboratory testing. To develop personal and interpersonal communications skills in an engineering context.

Prerequisites:

Nil - (unless specified in a "prescribed course of study" set as part of programme entry requirements)

Recommendations:

Success in this subject requires students to have a basic level of competence in mathematics at NCEA Level 2 standard. It is recommended that students do a refresher course/s to ensure they have current competence to achieve at this skill level.

Learning outcomes:

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

NO	LEARNING OUTCOME
1.	Classify and describe soils. 1.1 Describe soil materials to currently accepted NZ Codes 1.2 Classify soils using Unified Classification System. 1.3 Determine appropriate laboratory tests required for classification as per NZS 4402 1.4 Perform laboratory tests required for classification to NZS 4402
2.	Determine basic physical properties of a soil sample. 2.1 Carry out appropriate field and laboratory testing including recording of data to allow calculation of basic soil properties 2.2 Calculate results of above tests. Calculate the basic soil properties of density, void ratio, porosity and degree of saturation using the data obtained in 2.1 & 2.2 above

No	LEARNING OUTCOME
3.	Determine Engineering properties of soils. 3.1 Describe the compaction properties of soils 3.2 Perform Compaction test procedures in accordance with NZS 4402 3.3 Describe testing required for field control of Compaction and calculate results 3.4 Describe the shear strength mechanisms in soil in accordance with Coulomb's Law 3.5 Perform laboratory and field tests to determine unconfined shear strength and vane shear strength of soils
4.	Plan and carry out a civil engineering site investigation. 4.1 Carry out a preliminary desk study for a site investigation including consideration of health and safety requirements 4.2 Describe appropriate drilling plant and equipment for recovery of soil samples for laboratory testing 4.3 Describe appropriate in-situ tests and necessary equipment 4.4 Carry out a simple site investigation, collate and present data in an appropriate report format
5.	Demonstrate personal and interpersonal skills in model environment. 5.1 Listen effectively and summarise orally the main points made by previous speaker 5.2 Make notes of meetings and/or tutor's talk 5.3 Use word processing and other specialist software packages 5.4 Give oral instructions to accurately undertake a given task 5.5 Write a short logical report

Content/main topics:

Classification and description, soil samples, laboratory and field testing, physical properties, compaction properties, shear strength, permeability, site investigation.

Basis of assessment:

All assessments in this course are achievement based. The Final Overall Mark will be the sum of the Coursework Mark and the Examination Mark as detailed below.

The Coursework Mark is the weighted sum of the test, assignment, project, etc, marks. Course Information sheets (issued at the start of each course) will detail the individual weightings and coverage of each assessment task and end of term examination.

Assessment requirements:

Component	Assessment Task	Coursework Mark %	Overall Weighting
Coursework	Controlled Assessments (e.g. Tests)	50%	50%
	Uncontrolled Tasks (Assignments, Project, etc)	50%	
	Total Coursework Mark	100%	
	(To pass you must achieve a Coursework Mark of at least 40%)		
Examination	Total Examination Mark	100%	50%
	(To pass you must achieve an Examination Mark of at least 40%)		
Overall Course	(To pass you must achieve a Final Overall Mark of at least 50%)		100%

Required texts:

None. Printed course notes are provided

Recommended reading:

NZS 4402:1986. *Methods of testing soils for civil engineering purposes*. Wellington: Standards NZ

Burns, D., Farquhar, G., Mills, M., Williams, A. (2005). *Field Description of Soils and Rocks*. Wellington: NZ Geotechnical Society.

Silyn-Roberts, H. (2000) *Writing for Science and Engineering*. Oxford: Butterworth-Heinemann.

PROGRAMME CODE:	PROGRAMME TITLE:
TK0222	NZ Diploma in Engineering (Civil)
Course Descriptor	



COURSE CODE:	COURSE TITLE:
DCE4.457	ENGINEERING MATERIALS

WITT credit value: 9
Level: 4 Compulsory
Duration: 20 weeks
Internet based learning indicator: 2 - Web Supported

Learning hours:

Tutor contact hours	36
Self-directed hours	54
Total learning hours	90

Purpose:

To give students a basic knowledge of the properties and applications of a wide range of materials as commonly used in Civil Engineering projects. To develop personal and interpersonal communications skills in an engineering context.

Prerequisites:

Nil - (unless specified in a "prescribed course of study" set as part of programme entry requirements)

Recommendations:

Success in this subject requires students to have a basic level of competence in mathematics at NCEA Level 2 standard. It is recommended that students do a refresher course/s to ensure they have current competence to achieve at this skill level.

Learning outcomes:

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

NO	LEARNING OUTCOME
1.	Describe the properties and applications of concrete in Civil Engineering works <ul style="list-style-type: none"> 1.1 Describe the properties and desirable characteristics of the constituents of concrete 1.2 Discuss mix design and testing of concrete 1.3 Discuss the properties of concrete 1.4 Discuss the limitations and applications of site and ready mix concrete 1.5 Discuss the properties and applications of mortars and grouts 1.6 Discuss the properties and applications of fibre reinforced, lightweight and high density concrete.

No	LEARNING OUTCOME
2.	<p>Describe the properties and applications of steel and other metals in Civil Engineering works</p> <p>2.1 Describe the properties and the desirable characteristics of steel</p> <p>2.2 Discuss the properties of steel.</p> <p>2.4 Discuss briefly the properties and applications of other metals used in Civil Engineering</p> <p>2.5 Discuss briefly the corrosion of metals, how it affects their properties, and protection measures.</p> <p>2.6 Discuss commonly used jointing methods.</p>
3.	<p>Describe the properties and applications of timber in Civil Engineering works</p> <p>3.1 Describe the properties of commonly used timbers</p> <p>3.2 Discuss the properties and applications of preserved timbers</p> <p>3.3 Discuss the properties and applications of other timber products</p>
4.	<p>Describe the properties and applications of Roothing Materials in Civil Engineering works.</p> <p>4.1 Describe the properties and desirable characteristics of the various roading materials</p> <p>4.2 Discuss the testing of the various roading materials</p> <p>4.3 Discuss the properties and applications of filter materials and filter fabrics.</p>
5.	<p>Describe the properties and applications of other materials used in Civil Engineering works</p> <p>5.1 Describe the general characteristics and applications of recently developed materials.</p>
6.	<p>Demonstrate personal and interpersonal skills in model workplace environment.</p> <p>6.1 Listen effectively and summarise orally the main points made by previous speaker</p> <p>6.2 Make notes of meetings and/or tutors talk</p> <p>6.3 Use word processing and other specialist software packages</p> <p>6.4 Give oral instructions to accurately undertake a given task</p> <p>6.5 Write a short logical report</p>

Content/main topics:

Concrete - cement, sand, coarse aggregate, ad mixtures, tensile and compressive strength, durability and soundness. Steel - tensile strength, elastic properties, hardness, fatigue and ductility. Timber - tensile and compressive strength, durability, hardness and toughness. Roothing materials including sub-base aggregates, basecourse aggregates, sealing chips, bitumen (cutbacks and emulsions) and asphaltic concrete. New materials.

Basis of assessment:

All assessments in this course are achievement based. The Final Overall Mark will be the sum of the Coursework Mark and the Examination Mark as detailed below.

The Coursework Mark is the weighted sum of the test, assignment, project, etc, marks. Course Information sheets (issued at the start of each course) will detail the individual weightings and coverage of each assessment task and end of term examination.

Assessment requirements:

Component	Assessment Task	Coursework Mark %	Overall Weighting
Coursework	Controlled Assessments (e.g. Tests)	50%	50%
	Uncontrolled Tasks (Assignments, Project, etc)	50%	
	Total Coursework Mark	100%	
	(To pass you must achieve a Coursework Mark of at least 40%)		
Examination	Total Examination Mark	100%	50%
	(To pass you must achieve an Examination Mark of at least 40%)		
Overall Course	(To pass you must achieve a Final Overall Mark of at least 50%)		100%

Required texts:

None. Printed course notes are provided

Recommended reading:

Rollings M. P., Rollings R. S., (1996). *Geotechnical Materials in Construction*. New York: McGraw-Hill ISBN: 0070536651
Marotta T. W., Herubin C.A., (1997). *Basic Construction Materials*. New Jersey: Prentice Hall ISBN: 0135701694
Silyn-Roberts, H., (2000). *Writing for Science and Engineering*. Oxford: Butterworth-Heinemann.

PROGRAMME CODE:	PROGRAMME TITLE:
TK0222	NZ Diploma in Engineering (Civil)
Course Descriptor	



COURSE CODE:	COURSE TITLE:
DCE4.459	GEOLOGY

WITT credit value: 9
Level: 4 Compulsory
Duration: 20 weeks
Internet based learning indicator: 2 - Web Supported

Learning hours:

Tutor contact hours	36
Self-directed hours	54
Total learning hours	90

Purpose:

To examine the basic geological and geomorphological process acting within and on the Earth's crust. To develop personal and interpersonal communications skills in an engineering context.

Learning outcomes:

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

NO	LEARNING OUTCOME
1.	Identify the common rock-forming minerals 1.1 Explain the relationship between elements, minerals, & rocks 1.2 Describe the major characteristics of the following minerals: quartz, feldspar, biotite, muscovite, hornblende, augite, olivine, calcite, chlorite, and limonite.
2.	Investigate the properties of the three primary rock groups 2.1 Discuss the rock cycle 2.2 Classify igneous rock based on texture & silica content 2.3 Describe volcanic eruption styles from effusive (lava) to explosive (pyroclastic) 2.4 Describe how clastic (mechanical), organic, & chemically precipitated sedimentary rocks are formed 2.5 Describe the formation of metamorphic rocks 2.6 Identify rocks in hand specimen 2.7 Outline the general distribution of the three primary rock groups in New Zealand
3.	Describe significant mechanical properties of commonly occurring rocks 3.1 Describe the main physical properties of rocks 3.2 Describe the different ways rocks deform.

4.	<p>Identify typical geological crustal formations.</p> <p>4.1 Identify folds, faults, joints, & unconformities</p> <p>4.2 Describe how folds, faults, joints, & unconformities are formed</p>
5.	<p>Construct simple geological maps involving folded and faulted strata, superimposing normal, reverse, and transcurrent faults upon simply folded strata.</p> <p>5.1 Illustrate the typical symbols for dip and strike, faults, and folds.</p> <p>5.2 Determine outcrop patterns caused by folding, faulting, and unconformities</p> <p>5.3 Deduce geologic history from maps and sections.</p>
6.	<p>Discuss the nature of commonly occurring groundwater systems, with reference to New Zealand.</p> <p>6.1 Describe how groundwater penetrates, flows through, and is stored in soil & rock</p> <p>6.2 Describe how groundwater supply systems are formed.</p>
7.	<p>Identify the effects of common geomorphological processes with reference to the work done by water, ice, wind, mass movement, coastal erosion and deposition.</p> <p>7.1 Describe the processes of mechanical and chemical weathering</p> <p>7.2 Describe the causes of, and various types of landsliding</p> <p>7.3 Describe the erosional and depositional work of rivers and the features produced by them</p> <p>7.4 Describe the erosional and depositional influence of waves and the coastal features produced by them</p> <p>7.5 Describe the main features and deposits formed by past glaciations.</p>
8.	<p>Explain the concepts and evidence for plate tectonics, and its relevance to New Zealand, with particular reference to the distribution of earthquakes and volcanoes.</p> <p>8.1 Describe the crust, mantle, inner & outer core of the earth</p> <p>8.2 Describe the major differences between the oceanic & continental crust</p> <p>8.3 Explain evidence for continental drift and sea floor spreading</p> <p>8.4 Explain the various types of plate-plate interaction</p> <p>8.5 Illustrate the distribution of earthquakes, volcanic eruptions, & major fold mountain belts on maps of New Zealand and the world.</p>
9.	<p>Demonstrate personal and interpersonal skills in model workplace environment.</p> <p>9.1 Listen effectively and summarise orally the main points made by previous speaker</p> <p>9.2 Make notes of meetings and/or tutor's talk</p> <p>9.3 Use word processing and other specialist software packages</p> <p>9.4 Give oral instructions to accurately undertake a given task</p> <p>9.5 Write a short logical report.</p>

Content/main topics:

Igneous, sedimentary, metamorphic rocks, volcanoes: shield, composite, cataclysmic; lava, pyroclastics, Taupo Volcanic Zone metamorphic grade, foliation, schistosity, turbidites and Bouma sequences, Mohs hardness, mechanical properties of common

rocks, faults, folds, joints, geological maps; groundwater, erosion processes, colluvium, floodplains, rivers, coastlines, littoral drift, fore dune, glaciers, Karst topography, tectonics, lithosphere and asthenosphere, mantle, core, Alpine fault, subduction zones, spreading ridges, earthquakes: seismic waves, focus, epicentre, earthquake magnitude & intensity, shadow zone, Benioff zones.

Basis of assessment:

All assessments in this course are achievement based. The Final Overall Mark will be the sum of the Coursework Mark and the Examination Mark as detailed below.

The Coursework Mark is the weighted sum of the test, assignment, project, etc, marks. Course Information sheets (issued at the start of each course) will detail the individual weightings and coverage of each assessment task and end of term examination.

Assessment requirements:

Component	Assessment Task	Coursework Mark %	Overall Weighting
Coursework	Controlled Assessments (e.g. Tests)	50%	50%
	Uncontrolled Tasks (Assignments, Project, etc)	50%	
	Total Coursework Mark	100%	
	(To pass you must achieve a Coursework Mark of at least 40%)		
Examination	Total Examination Mark	100%	50%
	(To pass you must achieve an Examination Mark of at least 40%)		
Overall Course	(To pass you must achieve a Final Overall Mark of at least 50%)		100%

Required texts:

None. Printed course notes are provided

Recommended reading:

Blyth, F.G.H. & de Freitas, M.H. (1984). *A Geology for Engineers*. 325 pp. (7th ed.). London: Edward Arnold.
 Press F, Siever R, (1994). *Understanding Earth*. New York: WH Freeman & Co.
 Silyn-Roberts, H. (2000). *Writing for Science and Engineering*. Oxford: Butterworth-Heinemann

PROGRAMME CODE:	PROGRAMME TITLE:
TK0222	NZ Diploma in Engineering (Civil)
Course Descriptor	



COURSE CODE:	COURSE TITLE:
DCE4.558	STRUCTURES 1

WITT credit value: 9
Level: 4 Compulsory
Duration: 20 weeks
Internet based learning indicator: 2 - Web Supported

Learning hours:

Tutor contact hours	60
Self-directed hours	30
Total learning hours	90

Rationale for allocation of hours:

Extra contact hours have been allocated to this course to help improve student achievement in what historically has proven to be a difficult subject.

Purpose:

To introduce the techniques of basic structural analysis as applied to structural elements and simple structures.

Prerequisites:

DCE3.358 Mechanics

Learning outcomes:

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

NO	LEARNING OUTCOME
1.	Derive and apply the properties of sections. 1.1 Calculate the cross sectional areas of simple shapes. 1.2 Describe the first and second moments of an area. 1.3 Determine the position of the centroid and second moment of area of common shapes. 1.4 Apply the parallel axis theorem to second moment of area calculation 1.5 Define the polar second moment of area. 1.6 Calculate the radius of gyration. 1.7 Determine the section modulus values for simple shapes. 1.8 Select the section properties from steel charts.

No	LEARNING OUTCOME
2.	<p>Calculate stresses and strains caused by axial forces, shear forces and bending moments.</p> <p>2.1 Define simple stress and strain.</p> <p>2.2 Differentiate between compressive, tensile and shear stresses.</p> <p>2.3 Define proof stress, elastic limit stress and ultimate stress.</p> <p>2.4 Determine relationship between stress and strain for elastic materials.</p> <p>2.5 Explain Poisson's ratio.</p> <p>2.6 Explain stresses and strains associated with temperature, creep and shrinkage.</p> <p>2.9 Describe the theory of simple bending.</p> <p>2.10 Describe direct, shear, torsion and bending stresses and their distribution within the cross section of a structural element.</p> <p>2.11 Calculate direct shear and bending stresses for various cross sections.</p>
3.	<p>Describe the range of common structural loadings.</p> <p>3.1 Describe point loads, uniformly distributed loads, dead loads, live loads, wind and seismic loads.</p> <p>3.2 Explain how real loads are assessed.</p> <p>3.3 Describe the effect of an impact load.</p>
4.	<p>Analyse simply supported beams and cantilevers.</p> <p>4.1 Define simply supported beams and cantilevers.</p> <p>4.2 Describe theoretical and actual types of beam support.</p> <p>4.3 Calculate shear forces and bending moments and sketch shear force diagrams and bending moment diagrams.</p> <p>4.4 Define deflection and calculate deflections using supplied formulae.</p> <p>4.5 Identify critical sections of these types of beams.</p> <p>4.6 Describe the concept of maximum allowable design stress.</p>
5.	<p>Analyse trusses using method of joints and method of section.</p> <p>5.1 Define conditions of equilibrium.</p> <p>5.2 Describe the resolution of forces.</p> <p>5.3 Determine the axial forces in the members of a pin-jointed truss.</p>
6.	<p>Analyse simple columns.</p> <p>6.1 Analyse short columns with uni-axial bending.</p> <p>6.2 Calculate the Euler buckling loads.</p> <p>6.3 Understand and describe end conditions.</p>

Content/main topics:

Properties of sections, stresses and strains, common loads, structurally determinate beams (simply supported and free cantilevers), trusses, simple columns and simple structures.

Basis of assessment:

All assessments in this course are achievement based. The Final Overall Mark will be the sum of the Coursework Mark and the Examination Mark as detailed below.

The Coursework Mark is the weighted sum of the test, assignment, project, etc, marks. Course Information sheets (issued at the start of each course) will detail the individual weightings and coverage of each assessment task and end of term examination.

Assessment requirements:

Component	Assessment Task	Coursework Mark %	Overall Weighting
Coursework	Controlled Assessments (e.g. Tests)	50%	50%
	Uncontrolled Tasks (Assignments, Project, etc)	50%	
	Total Coursework Mark	100%	
	(To pass you must achieve a Coursework Mark of at least 40%)		
Examination	Total Examination Mark	100%	50%
	(To pass you must achieve an Examination Mark of at least 40%)		
Overall Course	(To pass you must achieve a Final Overall Mark of at least 50%)		100%

Required texts:

None. Printed course notes are provided

Recommended reading:

Williams, M., Todd, J. D., (2000). *Structures: theory and analysis*. Palgrave Macmillan.
Bhatt, P. & Nelson. H. M., (1990). *Structures* (3rd ed.). London: Longman Scientific.
Whitlow, R., (1991). *Materials and Structures*. London: Longman Scientific.

PROGRAMME CODE:	PROGRAMME TITLE:
TK0222	NZ Diploma in Engineering (Civil)
Course Descriptor	



COURSE CODE:	COURSE TITLE:
DCE5.505	ENGINEERING GEOLOGY

WITT credit value: 12
Level: 5 Elective
Duration: 20 weeks
Internet based learning indicator: 2 - Web Supported

Learning hours:

Tutor contact hours	48
Self-directed hours	72
Total learning hours	120

Purpose:

To investigate the properties, disposition and stability of rocks that have relevance to engineering projects.

Prerequisites:

DCE4.459 Geology

Learning outcomes:

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

NO	LEARNING OUTCOME
1.	Classify and describe rocks for engineering geology purposes. 1.1 Define the terms soil, rock, and soft rock 1.2 Describe rock from an engineering geological perspective 1.3 Classify rocks in the field using the New Zealand Geomechanics Society method 1.4 Discuss engineering aspects of igneous, sedimentary, and metamorphic rocks.
2.	Describe techniques for quantifying the significant physical properties of rocks which have relevance to the natural and developed environment. 2.1 Give details on how geologic material behaves when subjected to stresses 2.2 Describe the relationships between strength, cohesion, angle of internal friction, applied stresses, and failure 2.3 Calculate shear strength, cohesion, and angle of internal friction from applied stresses to failure (and their implications) 2.4 State rock strengths as measured in the laboratory and the field
3.	Differentiate between rock material and rock mass properties. 3.1 Describe changes that weathering causes to the engineering geological properties of rocks 3.2 Define the types of rock mass defects (discontinuities) 3.3 Classify and survey defects for engineering geological purposes

	3.4 Determine rock mass quality (including RQD) 3.5 Discuss engineering implications of rock mass defects 3.6 Compare and contrast rock mass classification systems and their uses
4.	Evaluate the suitability of commonly occurring New Zealand rocks for use as aggregates. 4.1 Define the properties of a good aggregate. 4.2 Describe processes that cause aggregates to degrade 4.3 Assess potential aggregate sources 4.4 Identify the types of rock that are used as aggregate in various areas of New Zealand.
5.	Utilise standard investigation planning techniques to carry out a geological site investigation. 5.1 Identify the tasks carried out at the various stages of a site investigation 5.2 Evaluate the various geophysical methods of investigation and assess the situations in which each could be used 5.3 Evaluate various subsurface methods of investigation
6.	Produce a simple geological map using field observations. 6.1 Measure dips and strikes using a compass - clinometer 6.2 Place field observations on a base map 6.3 Determine geological features from field observations and measurements.
7.	Interpret geological maps with reference to the alignment and orientation of folds and faults. 7.1 Draw structural contours for beds, faults, and folds from both surface exposure information and subsurface information and determine the orientation of these features 7.2 Use structural contours to complete outcrop patterns from incomplete exposures 7.3 Draw map cross sections 7.4 Describe the engineering implications of rock disposition on development projects from maps.
8.	Describe the factors which cause ground instability and subsidence in rocks and soils. 8.1 Classify landslides in natural and cut slopes 8.2 Develop simple mathematical models for the forces acting on a slide mass 8.3 Identify geological settings and human activities that may promote slope failure 8.4 Identify landslides, and procedures used to investigate landslides 8.5 Identify conditions under which subsidence will occur.
9.	Evaluate methods used for the restoration or improvement of unsuitable geologic conditions. 9.1 Identify prevention and remedial techniques for unstable slopesation. 9.2 Identify prevention and remedial techniques for ground subsidence

Content/main topics:

Physical properties of rocks material and soils including: compressive, tensile, and shear strengths, stress/strain relationship, Coulomb's equation, uniaxial and triaxial testing, and field index tests. Rock mass properties: weathering classification, changes of rock physical properties with weathering; defect analysis, rock mass classification systems (Rock Mass Rating, Norwegian Q). New Zealand Geomechanics Society Rock description method. Suitability of rock types for aggregates. Site investigation procedures and subsurface exploration techniques: geophysical techniques, boreholes. Land instability factors, including effects of water upon mass and shear strength. Landsliding and subsidence, and techniques for monitoring and remedying them including: Inclinometers, dewatering techniques, rock bolts, grout. Interpretation of geological structure and maps, including strike-slip analysis of faults and folds.

Basis of assessment:

All assessments in this course are achievement based. The Final Overall Mark will be the sum of the Coursework Mark and the Examination Mark as detailed below.

The Coursework Mark is the weighted sum of the test, assignment, project, etc, marks. Course Information sheets (issued at the start of each course) will detail the individual weightings and coverage of each assessment task and end of term examination.

Assessment requirements:

Component	Assessment Task	Coursework Mark %	Overall Weighting
Coursework	Controlled Assessments (e.g. Tests)	50%	50%
	Uncontrolled Tasks (Assignments, Project, etc)	50%	
	Total Coursework Mark	100%	
	(To pass you must achieve a Coursework Mark of at least 40%)		
Examination	Total Examination Mark	100%	50%
	(To pass you must achieve an Examination Mark of at least 40%)		
Overall Course	(To pass you must achieve a Final Overall Mark of at least 50%)		100%

Required texts:

None. Printed course notes are provided

Recommended reading:

Blyth, F.G.H. & de Freitas, M.H. (1984). *A Geology for Engineers*. (7th ed.). London: Edward Arnold.

Bell, FG, (1993). *Engineering Geology*. Oxford: Blackwell Scientific Publications.

Capper, PL; Cassie, WF; Geddes, JD. (1980). *Problems in Engineering Soils*. (3rd Ed.). London: E and F Spoon Ltd.

Craig, RF. (1992). *Soil Mechanics*. London: Chapman and Hall.

Goodman, RE. (1993). *Engineering Geology: Rock in Engineering Construction*. USA: John Wiley and Sons.

Hunt, R. (1984). *Geotechnical Engineering Investigation Manual*. New York: McGraw Hill

Kehew, AE. (1995). *Geology for Engineers and Environmental Scientists*. (2nd Ed.). New Jersey: Prentice Hall.

McLean, AC; Gribble, CD. (1980). *Geology for Civil Engineers*. London: Allen – Unwin.

Selby, MJ. (1993). *Hillslope Materials & Processes*. (2nd ed.). Oxford University Press.

Waltham, AC. (1994). *Foundations of Engineering Geology*. London: Blackie Academic.

PROGRAMME CODE:	PROGRAMME TITLE:
TK0222	NZ Diploma in Engineering (Civil)
Course Descriptor	



COURSE CODE:	COURSE TITLE:
DCE5.506	FLUID MECHANICS

WITT credit value: 12
Level: 5 Elective
Duration: 20 weeks
Internet based learning indicator: 2 - Web Supported

Learning hours:

Tutor contact hours	48
Self-directed hours	72
Total learning hours	120

Purpose:

To employ the principles of fluid mechanics in normal engineering hydraulic situations.

Prerequisites:

DCE4.454 Hydraulics / Hydrology

Learning outcomes:

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

No	LEARNING OUTCOME
1.	Define fluid terminology, units and symbols. 1.1 Describe the general characteristics of fluids.
2.	Describe the principles of fluid statics. 2.1 Describe the relationship between static head and fluid pressure 2.2 Define the relationships between pressures, forces and centres of pressure associated with plane and curved submerged surfaces 2.3 Describe and demonstrate the basic principles of statics in the application of manometers.
3.	Solve the problems associated with pipe line systems. 3.1 Apply Bernoulli and continuity equations to series, parallel and branching pipe systems, including reservoirs. 3.2 Apply momentum equations in pipe flow analysis. 3.2 Identify losses due to a range of sources including pipe friction, bends and valves 3.3 Solve problems using Hagen-Poiseuille, Darcy, Hazen Williams, Colebrook-White and Moody diagrams, charts and formulae.

4.	<p>Solve a range of open channel flow problems.</p> <p>4.1 Use specific energy methods and Manning's equation for open channel flow</p> <p>4.2 Describe the use of hydraulic jumps and related methods for the purpose of removing velocity energy from open channels and conduits</p> <p>4.3 Define critical depth and Froude Number</p> <p>4.4 Apply such methods to the prevention of scour and erosion development</p>
5.	<p>Demonstrate the process of energy conversion for pumps and turbines.</p> <p>5.1 Describe the types of pumps available to convert electrical/mechanical power to work including reciprocating, positive displacement and centrifugal systems</p> <p>5.2 Demonstrate the energy conversion system of turbines.</p> <p>5.3 Establish the system head curves for pipe systems and combine with the characteristic curves for centrifugal pumps and turbines, including power/cost relationship</p> <p>5.4 Develop the relationships for power, head and velocity in pumps with different speeds</p> <p>5.5 Establish the criteria controlling the development of cavitation in pumps and turbines.</p>
6.	<p>Describe the significance of viscosity in fluid flows.</p> <p>6.1 Define Newton's laws of viscosity</p> <p>6.2 Establish the definition and significance of Reynold's number and laminar, transitional and turbulent flow</p> <p>6.3 Describe the significance of boundary layers, fluid resistance, and surface and form drag in fluid flow.</p>
7.	<p>Evaluate ground water flow rates in pervious strata.</p> <p>7.1 Apply Darcy's law for calculating ground water flow rates.</p> <p>7.2 Utilise Reynold's numbers in calculations.</p>
8.	<p>Describe the use of a range of equipment used for the measurement of fluid flow in open and closed conduits.</p> <p>8.1 Apply formulae for theoretical and actual discharges using rectangular trapezoidal and V-notch weirs</p> <p>8.2 Illustrate the use of venturi meters, pitot tubes and current meters in fluid measurement.</p>

Content/main topics:

Fluid terminology, units and symbols, static head and fluid pressure, plane and curved submerged surfaces, manometers, pipeline systems, Bernoulli and continuity equations, Hagen-Poiseuille, Darcy, Hazen Williams, Colebrook-White and Moody diagrams, charts and formulae, open channel flow, Manning's, hydraulic jumps, scour and erosion, pumps and turbines, viscosity in fluid flows, Reynold's number, laminar, transitional and turbulent flow, ground water flow, measurement of fluid flow, weirs, venturi meters, pitot tubes, current meters.

Basis of assessment:

All assessments in this course are achievement based. The Final Overall Mark will be the sum of the Coursework Mark and the Examination Mark as detailed below.

The Coursework Mark is the weighted sum of the test, assignment, project, etc, marks. Course Information sheets (issued at the start of each course) will detail the individual weightings and coverage of each assessment task and end of term examination.

Assessment requirements:

Component	Assessment Task	Coursework Mark %	Overall Weighting
Coursework	Controlled Assessments (e.g. Tests)	50%	50%
	Uncontrolled Tasks (Assignments, Project, etc)	50%	
	Total Coursework Mark	100%	
	(To pass you must achieve a Coursework Mark of at least 40%)		
Examination	Total Examination Mark	100%	50%
	(To pass you must achieve an Examination Mark of at least 40%)		
Overall Course	(To pass you must achieve a Final Overall Mark of at least 50%)		100%

Required texts:

None. Printed course notes are provided

Recommended reading:

Douglas, J.F., Gasioreck, J.M. & Swaffield, J.A. (1985). *Fluid Mechanics*, London: Pitman Publishing.
 Kinskey, R. (1997). *Fluid Mechanics: Advanced Applications*, New York: McGraw Hill.
 Douglas, J.F. (1987). *Solving Problems in Fluid Mechanics Vol 1*. England: Longman.
 Lomax, W R & Saul, A.J. (1979). *Laboratory Work in Hydraulics*, London: Granada Pub.

PROGRAMME CODE:	PROGRAMME TITLE:
TK0222	NZ Diploma in Engineering (Civil)
Course Descriptor	



COURSE CODE:	COURSE TITLE:
DCE5.550	ENGINEERING MATHEMATICS 2A

WITT credit value: 12
Level: 5 Elective
Duration: 20 weeks
Internet based learning indicator: 2 - Web Supported

Learning hours:

Tutor contact hours	60
Self-directed hours	60
Total learning hours	120

Rationale for allocation of hours:

Extra contact hours have been allocated to this course to help improve student achievement in what historically has proven to be a difficult subject.

Purpose:

To expose students to a range of mathematical concepts and improve their mathematical skills to an advanced level specifically so that high achieving students may be better equipped to do further study at engineering degree level (It is strongly suggested that such students also complete DCE5.558 Engineering Mathematics 2B).

Prerequisites:

DCE4.450 Engineering Mathematics 1A
 DCE4.451 Engineering Mathematics 1B

Learning outcomes:

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

NO	LEARNING OUTCOME
1.	Apply to concepts of Functions and Coordinate Systems to: 1.1 Define and graph a relation and its inverse where the relation is: 1.1.1 simple polynomial eg. $y = kx^a$ 1.1.2 exponential 1.1.3 circular 1.1.4 hyperbolic 1.2 Recognise odd and even symmetries and their implications for the graph of a function 1.3 Convert among common coordinate systems 1.4 Graph plane curves in polar co-ordinates 1.5 Understand the importance of coordinate systems and surfaces in civil engineering mathematics

No	LEARNING OUTCOME
2.	<p>Apply the concepts of Vector Algebra to:</p> <ol style="list-style-type: none"> 2.1 Describe a 3 space vector as an ordered triple and in terms of the unit vectors $\mathbf{i}, \mathbf{j}, \mathbf{k}$ (include discussion of 2 space) 2.2 Perform vector addition, subtraction and multiplication by scalar quantities 2.3 Calculate the magnitude and the directed unit vector corresponding to a vector \mathbf{v} 2.4 Find the vector normal and vector tangent to a simple curve at a specified point 2.5 Find: <ol style="list-style-type: none"> (a) the vector between 2 points A, B in 3 space (b) the distance between the points A,B 2.6 Define the scalar product and describe its geometric significance in terms of projections 2.7 Prove the distributive and commutative laws for the scalar product 2.8 Apply the scalar product to simple physical problems 2.9 Define and find direction cosines 2.10 Define and evaluate determinants (up to order 3) 2.11 Define the cross product and describe its geometric properties 2.12 Verify the distributive law for the cross product 2.13 Apply the cross product to simple physical problems 2.14 State the equation of a plane 2.15 Find a vector \mathbf{N}, normal to a plane 2.16 Describe the algebraic and geometric properties of the triple scalar product 2.17 Define the algebraic and geometric properties of the triple vector product 2.18 Apply vectors to engineering applications
3.	<p>Use Linear Algebra to:</p> <ol style="list-style-type: none"> 3.1 Apply the rules for matrix addition, subtraction and scalar multiplication 3.2 Apply the rule for matrix multiplication 3.3 State the additive and multiplicative matrix identities 3.4 Investigate the commutative, associative and distributive properties of matrices 3.5 Apply the rules governing elementary row operations to obtain an inverse matrix 3.6 Show that a consistent set of linear equations may be represented in matrix form and hence find a solution set (using a variety of standard methods) 3.7 Understand the term 'row echelon form' 3.8 Find an inverse matrix by cofactors 3.9 Determine the Eigen values of a matrix 3.10 Determine the Eigen vectors for a matrix and relate this to scalar products. 3.11 Apply Eigen vectors to the linear transformation of Cartesian coordinate systems 3.12 Use matrices to solve engineering problems
4.	<p>Use Complex Algebra to:</p> <ol style="list-style-type: none"> 4.1 Convert between Cartesian and polar forms 4.2 Represent these forms on a drawing of the complex plane 4.3 Deduce and apply Euler's formula 4.4 Derive the fundamental identity $e^{j\pi} + 1 = 0$ 4.5 Develop the complex links between $\sin z$, $\cos z$, $\sinh z$ and $\cosh z$ 4.6 Deduce and use Osborne's Rule 4.7 Use complex numbers as an aid in integrating products of trigonometric and exponential functions 4.8 Define and evaluate the following functions: $\sin z$, $\cos z$, $\ln z$, $\sinh z$,

	$\cosh z$, z^n and combinations of these as appropriate 4.9 Find roots of complex numbers 4.10 Show the importance of complex numbers in professional engineering calculations
5.	Apply the concept of Series to: 5.1 Understand the term "limit" and the notion of convergence 5.2 Use L'Hopital's Rule 5.3 Write a Taylor Series for transcendental functions 5.4 Write a Maclaurin Series for transcendental functions

Content/main topics:

Coordinate systems, functions of more than one variable, vector notation and terminology, dot and cross products, vector laws, matrix operations, inverses, solutions to equations, complex numbers, functions of complex variable, series.

Basis of assessment:

All assessments in this course are achievement based. The Final Overall Mark will be the sum of the Coursework Mark and the Examination Mark as detailed below.

The Coursework Mark is the weighted sum of the test, assignment, project, etc, marks. Course Information sheets (issued at the start of each course) will detail the individual weightings and coverage of each assessment task and end of term examination.

Assessment requirements:

Component	Assessment Task	Coursework Mark %	Overall Weighting
Coursework	Controlled Assessments (e.g. Tests)	50%	50%
	Uncontrolled Tasks (Assignments, Project, etc)	50%	
	Total Coursework Mark	100%	
	(To pass you must achieve a Coursework Mark of at least 40%)		
Examination	Total Examination Mark	100%	50%
	(To pass you must achieve an Examination Mark of at least 40%)		
Overall Course	(To pass you must achieve a Final Overall Mark of at least 50%)		100%

Required texts:

None. Printed course notes are provided

Recommended reading:

Stroud, K. (1992). *Engineering Mathematics: Programmes and Problems*. (4th ed.). London: MacMillan Publishers

Course Descriptor**WITT credit value:** 12**Level:** 5 Compulsory**Duration:** 20 weeks**Internet based learning indicator:** 2 - Web Supported**Learning hours:**

Tutor contact hours	40
Self-directed hours	80
Total learning hours	120

Purpose:

To equip students with the understanding and basic skills to produce Civil Engineering and Survey drawings.

Prerequisites:

Nil - (unless specified in a "prescribed course of study" set as part of programme entry requirements)

Recommendations:

DCE4.452 Land Surveying

Learning outcomes:

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

NO	LEARNING OUTCOME
1.	Analyse the principles of drawing office practice. 1.1 Evaluate modern draughting equipment and mediums. 1.2 Describe national and international drawing standards. 1.3 Assess a range of plan reproduction methods.
2.	Produce a Topographical Survey Plan 2.1 Evaluate methods of plotting survey information from field notes. 2.2 Apply Survey Regulations to produce a topographical plan. 2.3 Identify the importance of site plans and survey control.
3.	Develop a set of Civil Engineering Construction Drawings 3.1 Produce longitudinal sections for roading and drainage projects. 3.2 Produce cross sections for roading and drainage projects. 3.3 Describe the benefits of test bores. 3.4 Outline the layout and sequence of drawings. 3.5 Explain the importance of drawings in contract documents.
4.	Produce a contour plan. 4.1 Critically review the methods of contouring and rules for plotting. 4.2 Critically analyse the use of contour maps for siting works. 4.3 Develop formation contours and establish batter limits using formation levels.

5.	Evaluate the different methods of calculating earthwork quantities. 5.1 Evaluate the different methods of determining areas of plotted figures (regular and irregular). 5.2 Analyse the methods of taking off earthwork volumes. 5.3 Identify and define problems linked to balancing cuts and fills. 5.4 Outline the plotting and application of mass curves.
6.	Produce horizontal and vertical alignment drawings for a roading project. 6.1 Define the principles of vertical and horizontal alignments. 6.2 Calculate and plot simple highway circular, transitional and vertical curves to approved standards.

Content/main topics:

Accepted drawing office practice, draughting equipment, mediums and international sheet sizes. Description of Land Title System, plotting topographical survey plans from field notes, sketches, and/or tabulated information. Traverses, topographical features, profiles, cross sections, test bores, locality and site plans. Draughting conventions for, and the plotting (and calculation) of simple highway circular, transitional and vertical curves. Layout of construction drawings. Methods of contouring, rules for plotting, use of contour maps for siting works. Plotting formation contours and establishing tops or toes of batters from formation levels. Determination of areas of plotted figures. Use of Planimeter. Taking off earthwork quantities including the end area method. Determination of areas from contours. Balancing of earthworks. Plotting and application of mass curves. Grading problems associated with roading and drainage projects.

Basis of assessment:

All assessments in this course are achievement based. The Final Overall Mark will be the sum of the Coursework Mark and the Examination Mark as detailed below.

The Coursework Mark is the weighted sum of the test, assignment, project, etc, marks. Course Information sheets (issued at the start of each course) will detail the individual weightings and coverage of each assessment task and end of term examination.

Assessment requirements:

Component	Assessment Task	Coursework Mark %	Overall Weighting
Coursework	Controlled Assessments (e.g. Tests)	50%	50%
	Uncontrolled Tasks (Assignments, Project, etc)	50%	
	Total Coursework Mark	100%	
	(To pass you must achieve a Coursework Mark of at least 40%)		
Examination	Total Examination Mark	100%	50%
	(To pass you must achieve an Examination Mark of at least 40%)		
Overall Course	(To pass you must achieve a Final Overall Mark of at least 50%)		100%

Required texts:

None. Printed course notes are provided

Recommended reading:

NZS5902.5:1981 *Building and civil engineering drawing practice*. Wellington: Standards New Zealand

PROGRAMME CODE:	PROGRAMME TITLE:
TK0222	NZ Diploma in Engineering (Civil)
Course Descriptor	



COURSE CODE:	COURSE TITLE:
DCE5.553	STRUCTURAL DRAWING

WITT credit value: 12
Level: 5 Compulsory
Duration: 20 weeks
Internet based learning indicator: 2 - Web Supported

Learning hours:

Tutor contact hours	40
Self-directed hours	80
Total learning hours	120

Purpose:

To give students an awareness of the requirements of New Zealand draughting standards and equip them with basic skills to produce drawings for simple concrete, steel and timber Civil Engineering Structures.

Prerequisites:

Nil - (unless specified in a "prescribed course of study" set as part of programme entry requirements)

Recommendations:

Students must be competent in using Computer Aided Draughting (CAD) software. It is recommended that students complete a CAD course, to at least basic level, to ensure they have current competence in the use of CAD software.

Learning outcomes:

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

No	LEARNING OUTCOME
1.	Produce scale drawings using an industry standard Computer Aided Draughting (CAD) programme. 1.1 Evaluate the computer environment, and plan CAD scale structural drawings. 1.2 Produce scale structural drawings to line stage to approved draughting standards using a CAD program. 1.3 Complete and verify CAD scale structural drawings. 1.4 Print CAD computer scale structural drawings, and manage drawing files.
2.	Produce a structural drawing in concrete to nationally recognised draughting standards 2.1 Apply the principles of good draughting practice and standards to reinforced concrete and prestressed concrete drawings of simple buildings and other structures in plan, elevation and sections. 2.2 Detail structural elements such as beams, column connections and anchorages. 2.3 Produce a bar bending schedule.

	2.4 Apply methods of taking off quantities for concrete and boxing.
3.	Produce a structural drawing in structural steel to nationally recognised draughting standards. 3.1 Apply the principles of good draughting practice and standards to produce structural steel drawings, showing members, ties, joints, struts, frame connections, columns, built up members of simple buildings and other structures in plan, elevation and sections. 3.2 Detail structural elements such as beams and column connections. 3.3 Produce a steel schedule.
4.	Complete a structural drawing in timber to nationally recognised standards 4.1 Apply the principles of good draughting practice and standards to produce timber drawings of simple buildings and other structures in plan, elevation and sections. 4.2 Detail timber structural elements such as trusses, stands and platforms, frames, beams, connections and fastenings. 4.3 Produce a timber and hardware schedule. 4.4 Define formwork and falsework and take off quantities.

Content/main topics:

Planning and preparation of CAD computer environment. File management.

Printing and verification of scale drawings. Material schedules.

Drawings of simple buildings and other structures in plan, elevations and sections.

Timber structures: details of construction of trusses, stands and platforms, frames, beams, connections and fastenings. Formwork and falsework.

Reinforced and prestressed concrete: detailing of structural elements (e.g. beams, columns, connections, anchorages). Taking off and scheduling bars.

Structural steel drawings: detailing of structural elements (e.g. ties, struts, joints, struts, frame connections, beams, columns, built up members; bolt details, size, number, spacing; welding details).

Basis of assessment:

All assessments in this course are achievement based. The Final Overall Mark will be the sum of the Coursework Mark and the Examination Mark as detailed below.

The Coursework Mark is the weighted sum of the test, assignment, project, etc, marks. Course Information sheets (issued at the start of each course) will detail the individual weightings and coverage of each assessment task and end of term examination.

Assessment requirements:

Component	Assessment Task	Coursework Mark %	Overall Weighting
Coursework	No Controlled Assessments for this course	-	50%
	Uncontrolled Tasks (Assignments, Project, etc)	100%	
	Total Coursework Mark	100%	
	(To pass you must achieve a Coursework Mark of at least 40%)		
Examination	Total Examination Mark	100%	50%
	(To pass you must achieve an Examination Mark of at least 40%)		
Overall Course	(To pass you must achieve a Final Overall Mark of at least 50%)		100%

Required texts:

None. Printed course notes are provided

Recommended reading:

SAA/SNZ HB1:1994 *Technical drawing for students*. Wellington: Standards NZ
NZS/AS 1100.501:2002 *Technical drawing: Structural engineering drawing* Wellington: Standards New Zealand
NZS 3101.1&2:2006 *Concrete Structures Standard*. Wellington: Standards New Zealand
NZS 3603:1993 *Timber Structures Standard*. Wellington: Standards New Zealand
NZS 3404.1&2:1997 *Steel Structures Standard*. Wellington: Standards New Zealand

PROGRAMME CODE:	PROGRAMME TITLE:
TK0222	NZ Diploma in Engineering (Civil)
Course Descriptor	



COURSE CODE:	COURSE TITLE:
DCE5.554	GEOTECHNICAL ENGINEERING 2

WITT credit value: 12
Level: 5 Elective
Duration: 20 weeks
Internet based learning indicator: 2 - Web Supported

Learning hours:

Tutor contact hours	48
Self-directed hours	72
Total learning hours	120

Purpose:

To extend the knowledge gained in DCE4.456 Geotechnical Engineering 1 to a fuller understanding of geotechnical testing procedures for engineering purposes.

Prerequisites:

DCE4.456 Geotechnical Engineering 1

Learning outcomes:

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

NO	LEARNING OUTCOME
1.	Use the concepts of Permeability to: 1.1 Carry out laboratory permeability measurements on granular soil. 1.2 Describe the procedures used to carry out field permeability tests 1.3 Calculate yield from wells in confined and unconfined aquifers
2.	Pressures in a mass of soil 2.1 Determine total, effective and pore water pressures in soils 2.2 Calculate and plot overburden pressure profiles 2.3 Use design charts to determine pressures exerted by surface loading at varying depths in a soil
3.	Consolidation 3.1 Describe the processes of consolidation and settlement including secondary consolidation
4.	Shear Strength 4.1 Describe methods used to determine shear strength parameters in both granular and cohesive soils in the laboratory 4.2 Perform shear box test on a granular soil and calculate shear strength parameters 4.3 Plot Mohr's Circle diagram for a triaxial compression test and use it to determine shear strength parameters 4.4 Perform triaxial compression test on a suitable soil sample and determine shear strength parameters

5.	Slope Stability 5.1 Describe standard modes of failure 5.2 Determine slope stability using circular arc analysis and Swedish method of slices 5.3 Determine slope stability using Taylor's curves for both cohesive and granular soils
6.	Pressure on retaining walls 6.1 Determine active, at rest and passive pressure co-efficients 6.2 Calculate earth pressures using Rankin's and Coulomb's theory for cohesionless soils 6.3 Calculate earth pressures resulting from sloping backfills and surcharge loading
7.	Bearing Capacity 7.1 Determine bearing capacity co-efficients N_c , N_q and N_γ 7.2 Calculate the bearing capacity of shallow foundations 7.3 Design simple shallow foundations

Content/main topics:

Laboratory tests and procedures, primary and secondary settlement, compressibility parameters, shear strength parameters, triaxial compression tests, slope stability, circular arc analysis, Swedish method of slices, bearing capacity and coefficients, shallow foundation design, pressure on retaining walls.

Basis of assessment:

All assessments in this course are achievement based. The Final Overall Mark will be the sum of the Coursework Mark and the Examination Mark as detailed below.

The Coursework Mark is the weighted sum of the test, assignment, project, etc, marks. Course Information sheets (issued at the start of each course) will detail the individual weightings and coverage of each assessment task and end of term examination.

Assessment requirements:

Component	Assessment Task	Coursework Mark %	Overall Weighting
Coursework	Controlled Assessments (e.g. Tests)	50%	50%
	Uncontrolled Tasks (Assignments, Project, etc)	50%	
	Total Coursework Mark	100%	
	(To pass you must achieve a Coursework Mark of at least 40%)		
Examination	Total Examination Mark	100%	50%
	(To pass you must achieve an Examination Mark of at least 40%)		
Overall Course	(To pass you must achieve a Final Overall Mark of at least 50%)		100%

Required texts:

None. Printed course notes are provided

Recommended reading:

NZS 4402.1TO7:1986 SET *Methods of testing soils for civil engineering purposes – Soil Tests*. Wellington: Standards New Zealand

PROGRAMME CODE:	PROGRAMME TITLE:
TK0222	NZ Diploma in Engineering (Civil)
Course Descriptor	



COURSE CODE:	COURSE TITLE:
DCE5.556	ENGINEERING SURVEYING

WITT credit value: 12
Level: 5 Elective
Duration: 20 weeks
Internet based learning indicator: 2 - Web Supported

Learning hours:

Tutor contact hours	48
Self-directed hours	72
Total learning hours	120

Purpose:

To introduce the concepts of Civil Engineering surveying so that students can carry out basic field measurements, recording and calculations and demonstrate good health and safety practices.

Prerequisites:

DCE4.452 Land Surveying

Learning outcomes:

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

NO	LEARNING OUTCOME
1.	Describe the key concepts of Engineering Surveying <ul style="list-style-type: none"> 1.1. Describe the principles of geodetic and plane surveying and the concepts of engineering surveying. 1.2. Safety aspects relating to surveying and instrument use including the concept of risk management and care of instruments. 1.3. Explain the role of Land Information New Zealand for acquisition of survey data. 1.4. Understand the types of measurement and corrections used in surveying. 1.5. Explain the concepts of error, precision and accuracy.
2.	Determine Vertical Height and Reduced Levels for Survey Purposes <ul style="list-style-type: none"> 2.1 Instrumentation is selected in accordance with job specification 2.2 Range: may include but not limited to: Digital levels, precise levels, theodolites, total station, GPS. 2.3 Methodology: may include but not limited to: differential levelling, trigonometrical levelling. 2.4 Describe special problems in differential levelling, reciprocal levelling, refraction and curvature corrections, sources of error and methods of adjustment, undertake a semi-precise closed levelling run

	<p>2.5 Field observations are undertaken in accordance with job specifications</p> <p>2.6 All determinations are checked in accordance with workplace procedures</p> <p>2.7 Closing errors are calculated and distributed in accordance with job specifications</p>
3.	<p>Apply mathematical concepts to Engineering Surveying</p> <p>3.1 Calculate all elements of a circular curve between intersecting alignments in accordance with survey industry standards</p> <p>3.2 Parabolic curves are calculated between intersecting vertical alignments</p> <p>3.3 Using parallel-sided figure calculations & determine boundaries.</p> <p>3.4 Using Ray tracing, calculate the final dimensions of a line.</p> <p>3.5 Using Resection, calculate position</p> <p>3.6 Using intersection, calculate position.</p> <p>3.7 Reduce field distances by for slope, environmental effects, sea level, projection, instrument / prism offset.</p> <p>3.8 Recognise and reject poor traverse closures.</p> <p>3.9 Use checks to eliminate errors in accordance with survey industry standards.</p> <p>3.10 Calculate missing lines and joins</p> <p>3.11 Calculate elevations from vertical angles.</p>
4.	<p>Undertake and record angular field measurements for survey purposes</p> <p>4.1 Survey instruments and targets are used and calibrated in accordance with manufacturers' specifications, may include but not limited to: total station, surveying/mining compass, theodolite.</p> <p>4.2 Environmental and topographical constraints are recognised and controlled to facilitate accurate angular measuring.</p>
5.	<p>Undertake and record Linear Field Measurements for survey purposes</p> <p>5.1 Survey equipment is used and calibrated in accordance with manufacturers' instructions (may include but not limited to: EDM, Total Station, GPS, metrological instruments).</p> <p>5.2 Undertake environmental, sea level, horizontal and projection corrections.</p>
6.	<p>Demonstrate good health and safety practices in Engineering Surveying</p> <p>6.1 Operate safely whilst conducting a surveying in an urban and rural environment.</p> <p>6.2 Safety precautions relating to COPTTM.</p> <p>6.3 PPE used whilst working a construction site</p> <p>6.4 Safety procedures are followed when excavating, placing new marks, and reinstating buried marks.</p> <p>6.5 Health and safety project management.</p> <p>6.6 Avoid confrontation whilst conducting a survey</p> <p>6.7 Observe cultural protocol whilst conducting a survey.</p>
7.	<p>Confirm the reliability of existing survey marks</p> <p>7.1 Research survey data</p> <p>7.2 Obtain existing documentary evidence</p> <p>7.3 Relate data to survey monuments in the field</p> <p>7.4 Confirm physical occupation in terms of survey information.</p>

Content/main topics:

Geodetic Surveying and Engineering Surveying Introduction, Traversing, Topographic Surveying, Areas, Volumes and Contours, Levelling, Control Surveying, Setting Out, Health and Safety in the Workplace.

Basis of assessment:

All assessments in this course are achievement based. The Final Overall Mark will be the sum of the Coursework Mark and the Examination Mark as detailed below.

The Coursework Mark is the weighted sum of the test, assignment, project, etc, marks. Course Information sheets (issued at the start of each course) will detail the individual weightings and coverage of each assessment task and end of term examination.

Assessment requirements:

Component	Assessment Task	Coursework Mark %	Overall Weighting
Coursework	Controlled Assessments (e.g. Tests)	50%	50%
	Uncontrolled Tasks (Assignments, Project, etc)	50%	
	Total Coursework Mark	100%	
	(To pass you must achieve a Coursework Mark of at least 40%)		
Examination	Total Examination Mark	100%	50%
	(To pass you must achieve an Examination Mark of at least 40%)		
Overall Course	(To pass you must achieve a Final Overall Mark of at least 50%)		100%

Required texts:

None. Printed course notes are provided

Recommended reading:

Bannister, A., Raymond, S., Baker, R., (1998), *Surveying* (7th ed.). Harlow, U.K.: Longman Scientific and Technical.
 Barry, B. A., (1991) *Errors in Practical Measurement in Surveying, Engineering and Technology*. USA: John Wiley and Sons.
 Uren, J., Price, W.F., (1994) *Surveying for Engineers* (3rd ed.). London: MacMillan.
 Wilson, R.J.P., (1983), *Land Surveying* (3rd ed.). Plymouth, U.K.: MacDonald & Evans.
 Schofield, W., (2001), *Engineering Surveying* (5th ed.). Oxford: Butterworth-Heinemann.
 Transit NZ (2004) *Code of Practice Temporary Traffic Management (COPTTM)*.
 Wellington: New Zealand Transport Agency - ISBN: 0-478-04701-0.

PROGRAMME CODE:	PROGRAMME TITLE:
TK0222	NZ Diploma in Engineering (Civil)
Course Descriptor	



COURSE CODE:	COURSE TITLE:
DCE5.557	TRAFFIC AND HIGHWAY ENGINEERING

WITT credit value: 12
Level: 5 Elective
Duration: 20 weeks
Internet based learning indicator: 2 - Web Supported

Learning hours:

Tutor contact hours	40
Self-directed hours	80
Total learning hours	120

Purpose:

To introduce the principles of traffic engineering and the design and construction of highways.

Prerequisites:

DCE5.552 Civil Drawing

Learning outcomes:

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

NO	LEARNING OUTCOME
1.	Examine vehicle characteristics and human interactions as related to road usage. 1.1 Apply human performance factors in relation to the driving task to road design. 1.2 Describe vehicle performance factors in relation to road design.
2.	Apply methods of undertaking traffic studies. 2.1 Evaluate traffic study methods for a range of purposes. 2.2 Determine traffic growth rates. 2.3 Describe traffic forecasts. 2.4 Apply statistical methods and sampling.
3.	Introduce those factors governing the interaction of traffic and highways which contribute to the engineering and design of a new highway. 3.1 Evaluate the physical and environmental capacities of a given highway segment. 3.2 Calculate the Level of Service at which a given highway segment operates. 3.3 Specify appropriate design parameters including appropriate cross sectional standards in relation to road hierarchy under various atypical circumstances. 3.4 Identify relevant legislation.

4.	Develop detailed design for a road. 4.1 Discuss design speed environment, speed values and design superelevation for roading alignments and geometric elements. 4.2 Design and set out circular and equal transitioned horizontal curves. 4.3 Design a vertical alignment for a given roading project. 4.4 Identify requirements for geotechnical features and structural design aspects.
5.	Examine drainage requirements for road design. 5.1 Identify the sources of water infiltration to road pavements. 5.2 Illustrate the principles and methods of dealing with surface, sub-surface and road-side drainage. 5.3 Calculate catchment runoff quantities, at a given location, given certain catchment area and characteristics. 5.4 Identify transport pollutant sources in stormwater. 5.5 Describe methods of stormwater quality control.
6.	Describe roading construction and maintenance techniques from site establishment, earthworks and formation construction through to pavement layers, surfacing and maintaining the constructed asset. 6.1 Determine site establishment and site clearing requirements. 6.2 Describe TNZ's Roding performance specification system and its relevance to standardisation and quality of materials and construction control. 6.3 Describe and illustrate formation and pavement layer construction techniques. 6.4 Outline the principles, tasks and strategies for maintaining the road asset.

Content/main topics:

Traffic engineering, human and vehicle characteristics, traffic surveys, road and link capacity, environmental capacity, levels of service, road hierarchy, cross sectional standards.

Highway Engineering, road design, vertical and horizontal geometrics, speed environment, design speeds, road surface and sub-surface drainage, stormwater treatment devices, earthworks, TNZ performance specifications, pavements construction, road surfacings, RAMM, maintenance strategies.

Basis of assessment:

All assessments in this course are achievement based. The Final Overall Mark will be the sum of the Coursework Mark and the Examination Mark as detailed below.

The Coursework Mark is the weighted sum of the test, assignment, project, etc, marks. Course Information sheets (issued at the start of each course) will detail the individual weightings and coverage of each assessment task and end of term examination.

Assessment requirements:

Component	Assessment Task	Coursework Mark %	Overall Weighting
Coursework	Controlled Assessments (e.g. Tests)	50%	50%
	Uncontrolled Tasks (Assignments, Project, etc)	50%	
	Total Coursework Mark	100%	
	(To pass you must achieve a Coursework Mark of at least 40%)		
Examination	Total Examination Mark	100%	50%
	(To pass you must achieve an Examination Mark of at least 40%)		
Overall Course	(To pass you must achieve a Final Overall Mark of at least 50%)		100%

Required texts:

None. Printed course notes are provided

Recommended reading:

Ogden, K.W. & Taylor, S.Y. (1996). *Traffic Engineering and Management*. Victoria, Australia: Institute of Transport Studies, Dept of Civil Engineering, Monash University.

AUSTROADS (2003), *Rural Road Design: Guide to the Geometric Design of Rural Roads*. Sydney: Australia: Austroads Inc.

AUSTROADS, (1992), *Pavement Design: A guide to the Structural Design of Road Pavements*. Sydney: Australia: Austroads Inc.

Transit NZ (2000). New Zealand Supplement to the Document: *Pavement Design: A guide to the Structural Design of Road Pavements*. (Austroads 1992). Wellington: Transit New Zealand.

NZS 4402.1TO7:1986 SET *Methods of testing soils for civil engineering purposes – Soil Tests*. Wellington: Standards New Zealand

NZIHT (1999) *RAMM Treatment Selection Workshop Manual*. Wellington: Transfund NZ.

NZ Transport Agency (1996). *State Highway Database Operations Manual*. Wellington: Transit NZ.

Transfund NZ. (1997) *RAMM Road Condition and Roughness Rating Manual PFM6*. Wellington: Transfund NZ.

PROGRAMME CODE:	PROGRAMME TITLE:
TK0222	NZ Diploma in Engineering (Civil)
Course Descriptor	



COURSE CODE:	COURSE TITLE:
DCE5.558	ENGINEERING MATHEMATICS 2B

WITT credit value: 12
Level: 5 Elective
Duration: 20 weeks
Internet based learning indicator: 2 - Web Supported

Learning hours:

Tutor contact hours	60
Self-directed hours	60
Total learning hours	120

Rationale for allocation of hours:

Extra contact hours have been allocated to this course to help improve student achievement in what historically has proven to be a difficult subject.

Purpose:

To expose students to a range of mathematical concepts and improve their mathematical skills to an advanced level specifically so that high achieving students may be better equipped to do further study at engineering degree level (It is strongly suggested that such students also complete DCE5.550 Engineering Mathematics 2A).

Prerequisites:

DCE4.450 Engineering Mathematics 1A
 DCE4.451 Engineering Mathematics 1B

Learning outcomes:

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

NO	LEARNING OUTCOME
1.	Apply the concepts of Differential Calculus to: <ul style="list-style-type: none"> 1.1 Review differentiation theory and methods 1.2 Perform implicit differentiation 1.3 Recognise a composite function and state the Chain Rule for its derivative 1.4 Understand the terms concavity, critical point, inflexion, continuity, increasing and decreasing 1.5 Define and apply the ∂ operator 1.6 Use the Chain Rule for functions of more than one variable 1.7 Use partial derivatives to explore 1.4 1.8 Use partial differentiation to solve practical civil engineering problems

No	LEARNING OUTCOME
2.	<p>Apply the concepts of Integral Calculus to:</p> <ul style="list-style-type: none"> 2.1 Review integration theory and methods 2.2 Find an integral by expansion to partial fractions 2.3 Find an integral by trigonometric or hyperbolic substitution 2.4 Use integration techniques to find the length of a plane curve 2.5 Use integration to find the area of a surface of revolution 2.6 Use integration to find the volume of a solid of revolution 2.7 Use the method of integration by parts to integrate products of functions (excluding reduction formulae) 2.8 Evaluate and use double integrals 2.9 Use integration to solve practical civil engineering problems.
3.	<p>Use Differential Equations concepts to:</p> <ul style="list-style-type: none"> 3.1 Define the terms such as: differential equation, order, degree, initial condition, boundary condition, general solution 3.2 Distinguish first and second order Linear D.Es 3.3 Recognise that the general solution of a D.E. describes a family of curves and that the particular solution describes a unique curve 3.4 Solve a first order linear DE by: <ul style="list-style-type: none"> 3.4.1 direct integration 3.4.2 separation of variables 3.4.3 integrating factor 3.4.4 substituting $y = bx$ for homogeneous DEs 3.5 Solve a homogeneous second order D.E. of the form $ay'' + by' + cy = 0$ for all real a, b, c 3.6 Solve a <u>simple</u> second order non-homogeneous D.E. 3.7 Apply the above techniques, where appropriate, to find the particular solution for civil engineering problems.
4.	<p>Use Numerical Methods concepts to:</p> <ul style="list-style-type: none"> 4.1 Construct Newton Gregory difference tables 4.2 Find an interpolating polynomial from data 4.3 Use an interpolating polynomial to determine the value of slope at a particular point. 4.4 Develop the trapezium rule from a Newton Gregory difference table. 4.5 Develop the Simpson's 1/8 rule from a Newton Gregory difference table. 4.6 Apply numerical techniques to solve problems in Calculus 4.7 Develop and use an iterative method to solve simple first order differential equations. Such a method could be one of bisection, Euler, Taylor etc but not Runge-Kutta or above 4.8 Know that a numerical process has an associated error bound and that such a bound should be evaluated and presented along with the numerical answer itself 4.9 Apply numerical method to solve practical civil engineering problems.

Content/main topics:

Key differentiation theorems, terminology and techniques, partial derivatives, local extrema, substitution, partial fractions, length of curves, area, volume, double integrals, ordinary differential equations to order 2, practical DE problems, interpolating polynomials, numerical differentiation, numerical integration, numerical solution to differential equations, errors.

Basis of assessment:

All assessments in this course are achievement based. The Final Overall Mark will be the sum of the Coursework Mark and the Examination Mark as detailed below.

The Coursework Mark is the weighted sum of the test, assignment, project, etc, marks. Course Information sheets (issued at the start of each course) will detail the individual weightings and coverage of each assessment task and end of term examination.

Assessment requirements:

Component	Assessment Task	Coursework Mark %	Overall Weighting
Coursework	Controlled Assessments (e.g. Tests)	70%	50%
	Uncontrolled Tasks (Assignments, Project, etc)	30%	
	Total Coursework Mark	100%	
	(To pass you must achieve a Coursework Mark of at least 40%)		
Examination	Total Examination Mark	100%	50%
	(To pass you must achieve an Examination Mark of at least 40%)		
Overall Course	(To pass you must achieve a Final Overall Mark of at least 50%)		100%

Required texts:

None. Printed course notes are provided

Recommended reading:

Stroud, K. (1992). *Engineering Mathematics: Programmes and Problems*. (4th ed.). London: MacMillan Publishers

PROGRAMME CODE:	PROGRAMME TITLE:
TK0222	NZ Diploma in Engineering (Civil)
Course Descriptor	



COURSE CODE:	COURSE TITLE:
DCE5.655	STRUCTURES 2

WITT credit value: 12
Level: 5 Elective
Duration: 20 weeks
Internet based learning indicator: 2 - Web Supported

Learning hours:

Tutor contact hours	50
Self-directed hours	70
Total learning hours	120

Purpose:

To develop an ability to derive actions for simple structures, analyse determinate and indeterminate structures, and to design and check for ULS and SLS steel and timber sections

Prerequisites:

DCE4.558 Structures 1

Learning outcomes:

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

NO	LEARNING OUTCOME
1.	Describe in principle the range of common types of structural systems. 1.1 Structural elements: trusses, frames, cables, arches, plates, shells 1.2 Common structural systems: trussed frames, braced systems, cables and suspension systems, slabs and grids, roof structures. 1.3 Structural analysis: study of the relationship involving the structural materials, members, loads acting on the structures, deflections and forces.
2.	Describe in principle the range of common loading - AS/NZS 1170.0:2002, AS/NZS 1170.1:2002. 2.1 Describe limit state methods. 2.2 Explain permanent actions and short term and long term imposed actions. 2.3 Explain other actions: liquid pressure, ground water, rainwater pounding and earth pressure. 2.4 Calculate permanent actions for floors and horizontal and sloping roofs. 2.5 Combinations of actions

3.	Describe and calculate wind actions – AS/NZS 1170.2:2002. 3.1 Design wind pressure and distributed forces 3.2 Regional wind speeds 3.3 Site exposure multipliers
4.	Describe and calculate earthquake actions - AS/NZS 1170.5:2004. 4.1 Site hazard spectra 4.2 Structural characteristics 4.3 Design earthquake actions 4.4 Structural analysis
5.	Determinate structures: continuous determinate beams and frames. 5.1 Calculate and plot shear force for determinate beams and frames. 5.2 Calculate and plot bending moment for determinate beams and frames. 5.3 Apply (Mohr's) Moment – area theorems: define rotations and displacements of deflected shapes of beams, verify the standard expressions for deflection calculation, calculate the deflection anywhere along a statically determinate beam carrying point loads, and locate the point of maximum deflection for a simply supported beam carrying point loads
6.	Indeterminate structures: continuous beams and frames. 6.1 Solve problems involving plotting SFD and BMD for single span statically indeterminate beams. 6.2 Define principle of superposition and elastic shear. 6.3 Apply moment-distribution method: define relative stiffness, distribution factors and fixed ended moments. 6.4 Solve problems involving plotting SFD and BMD for continuous indeterminate beams and rectangular portal structures using moment-distribution method.
7.	Produce bending moment diagrams for multi-storey frames. 7.1 Using approximate method of analysis: for gravity actions and lateral actions. 7.2 Using two-dimensional frame analysis computer programme: e.g. Multiframe.
8.	Steel and Timber basic design and check for ULS and SLS 8.1 Determine capacities of simple timber and steel section at Ultimate Limit State. 8.2 Calculate flexural deflection of simple timber and steel beams at Serviceability Limit State

Content/main topics:

Loads from AS/NZS 1170, Moment-area theorems, moment distribution, BMDs for determinate and indeterminate structures, steel and timber basic design and check for ULS and SLS.

Basis of assessment:

All assessments in this course are achievement based. The Final Overall Mark will be the sum of the Coursework Mark and the Examination Mark as detailed below.

The Coursework Mark is the weighted sum of the test, assignment, project, etc, marks. Course Information sheets (issued at the start of each course) will detail the individual weightings and coverage of each assessment task and end of term examination.

Assessment requirements:

Component	Assessment Task	Coursework Mark %	Overall Weighting
Coursework	Controlled Assessments (e.g. Tests)	50%	50%
	Uncontrolled Tasks (Assignments, Project, etc)	50%	
	Total Coursework Mark	100%	
	(To pass you must achieve a Coursework Mark of at least 40%)		
Examination	Total Examination Mark	100%	50%
	(To pass you must achieve an Examination Mark of at least 40%)		
Overall Course	(To pass you must achieve a Final Overall Mark of at least 50%)		100%

Required texts:

None. Printed course notes are provided

Recommended reading:

Most textbooks dealing with simple structural analysis will contain useful information.

Hibbeler, R.C. (2006) *Structural Analysis (6th ed.)* New Jersey: Pearson Prentice Hall.

AS/NZS 1170.0:2002 *Structural design actions - General principles*. Wellington: Standards New Zealand

AS/NZS 1170.1:2002 *Structural design actions - Permanent, imposed and other actions*. Wellington: Standards New Zealand

AS/NZS 1170.2:2002 *Structural design actions - Wind actions*. Wellington: Standards New Zealand

AS/NZS 1170.3:2003 *Structural design actions - Snow and ice actions*. Wellington: Standards New Zealand

AS/NZS 1170.5:2004 *Structural design actions - Earthquake actions*. Wellington: Standards New Zealand

Australian Institute of Steel Construction (AISC) (1999) *Design capacity tables for structural Steel – Volume 1: Open Sections (3rd ed.)*. Sydney, Australia: AISC.

NZS 3404.1 and 2:1997 *Steel structures standard*. Wellington: Standards New Zealand.

NZS 3603:1993 *Timber structures standard*. Wellington: Standards New Zealand.

PROGRAMME CODE:	PROGRAMME TITLE:
TK0222	NZ Diploma in Engineering (Civil)
Course Descriptor	



COURSE CODE:	COURSE TITLE:
DCE6.605	PUBLIC HEALTH: WATER

WITT credit value: 18
Level: 6 Elective
Duration: 20 weeks
Internet based learning indicator: 2 - Web Supported

Learning hours:

Tutor contact hours	36
Self-directed hours	144
Total learning hours	180

Rationale for allocation of hours:

Reduced contact hours have been allocated to this course to encourage these final stage diploma students to take greater responsibility for directing their own learning.

Purpose:

To develop student understanding and design expertise sufficient to design a small water reticulation system to meet good practice requirements.

Prerequisites:

DCE5.506 Fluid Mechanics

Learning outcomes:

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

NO	LEARNING OUTCOME
1.	Discuss the requirements and standards of consumable water. 1.1 Describe the standards relating to the physical, chemical and biological features of potable water. 1.2 Evaluate importance of water quality factors. 1.3 Evaluate the effects of micro-organisms. 1.4 Describe typical laboratory testing procedures for potable water.
2.	Analyse the role and responsibilities of local authorities and other organisations in maintaining standards for the supply of water. 2.1 Describe Public Health considerations using the Resource Management Act and the World Health Organisation recommendations.
3.	Calculate and analyse hydrological supply factors. 3.1 Evaluate reliable sources of surface water supplies. 3.2 Calculate safe yield, minimum storage requirements, stream flow and catchment characteristics, rainfall intensity and distribution. 3.3 Determine sources of pollution. 3.4 Describe a range of treatment methods.

4.	Analyse the parameters associated with subsurface aquifer water supply systems. 4.1 Apply geometry limitations, maximum drawdown rates, including monitoring strategies. 4.2 Describe rates of aquifer recharge. 4.3 Identify sources of contamination.
5.	Design small water reticulation systems. 5.1 Design an enclosed pipe network system. 5.2 Apply total energy concepts considering energy losses in small reticulation systems, reservoirs and pumps. 5.3 Specify appropriate field testing procedures.
6.	Explain the Maori cultural concepts towards water usage. 6.1 Integrate the Maori cultural attitudes to water.

Content/main topics:

Potable water, and water quality factors such as: alkalinity, conductivity, colour, taste, odour, suspended solids, dissolved oxygen, turbidity, radioactivity, biochemical oxygen demand, nitrogen and chloride content. Quality of water. public health considerations. World Health Organisation standards and micro-organisms such as, pathogens, Escherichia coli, algae. Water Supply requirements and treatment processes such as: coagulation, sedimentation, sand filtration, chemical adjustment. Water reticulation systems and components such as, pumps, fire fighting requirements, reservoirs, earth dams, construction.

Basis of assessment:

All assessments in this course are achievement based. The Final Overall Mark will be the sum of the Coursework Mark and the Examination Mark as detailed below.

The Coursework Mark is the weighted sum of the test, assignment, project, etc, marks. Course Information sheets (issued at the start of each course) will detail the individual weightings and coverage of each assessment task and end of term examination.

Assessment requirements:

Component	Assessment Task	Coursework Mark %	Overall Weighting
Coursework	Controlled Assessments (e.g. Tests)	50%	50%
	Uncontrolled Tasks (Assignments, Project, etc)	50%	
	Total Coursework Mark	100%	
	(To pass you must achieve a Coursework Mark of at least 40%)		
Examination	Total Examination Mark	100%	50%
	(To pass you must achieve an Examination Mark of at least 40%)		
Overall Course	(To pass you must achieve a Final Overall Mark of at least 50%)		100%

Required texts:

None. Printed course notes are provided

Recommended reading:

Abdel-Aziz, I.K. (1987) *Groundwater Engineering*. New York: McGraw Hill.
Barnes, D. Bliss, P.J. Gould, B.W. and Valentine, H.R. (1981) *Water and Wastewater Engineering Systems*. Pitman Publishing.
Chadwick, A. & Morfett, J. (1991). *Hydraulics in Civil Engineering*. Hampshire, UK: Chapman Hall.
Davis, M.L. & Cornwell, D. A. (1991). *Introduction to Environmental Engineering*. (2nd ed.). New York: McGraw-Hill.
Droste, R.L. (1997). *Theory and Practice of Water and Wastewater Treatment*. New Jersey: John Wiley & Sons.
Fair, G.M. Geyer, J.C. Okun, D.A. (1971) *Elements of Water Supply and Wastewater Disposal*. (2nd ed.). New Jersey: John Wiley & Sons.
Janna, W S. (1991) *Introduction to Fluid Mechanics*. Boston: PWS - Kent Publishing.
McGhee, T. J. (1991). *Water Supply and Sewerage*. (6th Ed.). New York: McGraw-Hill.
Resource Management Act 1991 and Regulations. Data Services Limited.
Resource Management Handbook. 1991 Data Services Limited.
Viessman, W., Hammer, M.J.(1993). *Water Supply and Pollution Control*. (5th Ed.). New York: Harper Collins.

Waitangi Tribunal Reports:

Waitangi Tribunal (1989). *Report of the Waitangi Tribunal on the Kaituna River Claim*. (2nd ed.). Wellington NZ: Waitangi Tribunal, Department of Justice.
Waitangi Tribunal (1989). *Motunui – Waitara Report Waitangi Tribunal 1983*. (2nd ed.). Wellington NZ: Waitangi Tribunal, Department of Justice.
Waitangi Tribunal (1989). *Report of the Waitangi Tribunal on the Manukau Claim*. (2nd ed.). Wellington NZ: Waitangi Tribunal, Department of Justice.

PROGRAMME CODE:	PROGRAMME TITLE:
TK0222	NZ Diploma in Engineering (Civil)
Course Descriptor	



COURSE CODE:	COURSE TITLE:
DCE6.606	PUBLIC HEALTH: WASTE

WITT credit value: 18
Level: 6 Elective
Duration: 20 weeks
Internet based learning indicator: 2 - Web Supported

Learning hours:

Tutor contact hours	36
Self-directed hours	144
Total learning hours	180

Rationale for allocation of hours:

Reduced contact hours have been allocated to this course to encourage these final stage diploma students to take greater responsibility for directing their own learning.

Purpose:

To develop student understanding and expertise sufficient for them to investigate and assess acceptable small scale methods for the disposal of wastewater and solid refuse.

Prerequisites:

NIL

Recommendations:

DCE4.454 Hydraulics / Hydrology

Learning outcomes:

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

NO	LEARNING OUTCOME
1.	Describe the factors relating to the quantity and quality of waste-water generated in urban and industrial catchments. 1.1 Identify typical properties of domestic, commercial and industrial waste-water including stormwater. 1.2 Define the significance of parameters such as turbidity, acidity, alkalinity, metals, dissolved oxygen (DO), biochemical oxygen demand (BOD) and total oxygen demand. 1.3 Evaluate the effects of micro-organisms. 1.4 Describe the testing procedures to determine and identify contaminants in waste-water
2.	Design small reticulation pipe line networks, including pump stations. 2.1 Select mean flow and peaking factors for a domestic catchment. 2.2 Select appropriate pipe materials. 2.3 Evaluate the cost effectiveness of the system

No	LEARNING OUTCOME
3.	<p>Evaluate a range of treatment processes used for pollution control.</p> <p>3.1 Describe pre-treatment, primary, secondary and tertiary treatment techniques used in large scale municipal wastewater plants.</p> <p>3.2 Describe the function of screening, grit removal, sedimentation, trickling filters, fixed growth reactors, oxidation ponds, coagulation and flocculation, activated sludge processes and odour control.</p> <p>3.3 Describe the function of solids removal from waste-water, sludge digestion and sludge dewatering, drying and disposal.</p> <p>3.4 Analyse the operation and efficiencies of given treatment plants.</p>
4.	<p>Describe alternative sewage treatment systems commonly used in areas which are not reticulated.</p> <p>4.1 Describe the function of small scale waste-water disposal methods such as septic tanks evapotranspiration beds, marsh or wet-land systems, spray irrigation, sand filters, bio-logical contactors and filters, infiltration and soakage drains.</p> <p>4.2 Apply the New Zealand Waste Management Hierarchy for on-site waste-water disposal such as T.P. No 58.</p>
5.	<p>Identify the nature, quantity and methods of disposal of solid waste generated from residential and commercial areas.</p> <p>5.1 Describe sanitary landfills, construction and operation, waste management techniques, incineration processes, leachate collection, treatment and disposal.</p> <p>5.2 Analyse the operation and efficiency of a typical landfill such as Greenmount.5</p>
6.	<p>Evaluate the Maori cultural concepts of waste management</p> <p>6.1 Describe the Maori cultural perspectives as they are associated with waste management</p>

Content/main topics:

Waste-water, stormwater, urban and industrial catchments, waste-water micro-organisms such as: pathogens and Escherichia coli, total and faecal coliforms, protozoa, helminths, algae, fungi and small invertebrates. Reticulation systems, minimum velocities, gravitational and rising mains, pumping stations, energy losses, manholes, pipes, pipe materials and rehabilitation methods. Treatment processes, pre-treatment, primary, secondary, tertiary, screening, grit removers, sedimentation, trickling filters, fixed growth reactors, oxidation ponds, coagulation, flocculation, activated sludge, odour control. Alternative wastewater disposal systems: septic tanks, evapotranspiration beds, wet land systems, spray irrigation, sand filters, biological contactors and filters, infiltration and soakage drains. Solid waste: disposal systems, sanitary landfills, construction and operation methods, waste management, incineration, leachate collection, treatment and disposal.

Basis of assessment:

All assessments in this course are achievement based. The Final Overall Mark will be the sum of the Coursework Mark and the Examination Mark as detailed below.

The Coursework Mark is the weighted sum of the test, assignment, project, etc, marks. Course Information sheets (issued at the start of each course) will detail the individual

weightings and coverage of each assessment task and end of term examination.

Assessment requirements:

Component	Assessment Task	Coursework Mark %	Overall Weighting
Coursework	Controlled Assessments (e.g. Tests)	50%	50%
	Uncontrolled Tasks (Assignments, Project, etc)	50%	
	Total Coursework Mark	100%	
	(To pass you must achieve a Coursework Mark of at least 40%)		
Examination	Total Examination Mark	100%	50%
	(To pass you must achieve an Examination Mark of at least 40%)		
Overall Course	(To pass you must achieve a Final Overall Mark of at least 50%)		100%

Required texts:

None. Printed course notes are provided

Recommended reading:

Barnes, D. Bliss, P.J. Gould, B.W. and Valentine, H.R. (1981) *Water and Wastewater Engineering Systems*. Pitman Publishing.

Chadwick, A. & Morfett, J. (1991). *Hydraulics in Civil Engineering*. Hampshire, UK: Chapman Hall.

Davis, M.L. & Cornwell, D. A. (1991). *Introduction to Environmental Engineering*. (2nd ed.). New York: McGraw-Hill.

Department of Health. (1992). *Public Health Guidelines for the safe use of sewage effluent and sewage sludge on land*. Wellington, Public Health Services.

Droste, R.L. (1997). *Theory and Practice of Water and Wastewater Treatment*. New Jersey: John Wiley & Sons.

Fair, G.M. Geyer, J.C. Okun, D.A. (1971) *Elements of Water Supply and Wastewater Disposal*. (2nd ed.). New Jersey: John Wiley & Sons.

Gunn, I. (1994). *Alternative Wastewater Treatment Systems for Small Communities*. Department of Civil and Environmental Engineering, University of Auckland.

Gunn, I. (1994) *On-Site Wastewater Systems*. Department of Civil and Environmental Engineering, University of Auckland.

Janna, W S. (1991) *Introduction to Fluid Mechanics*. Boston: PWS - Kent Publishing.

McGhee, T. J. (1991). *Water Supply and Sewerage*. (6th Ed.). New York: McGraw-Hill.

Resource Management Act 1991 and Regulations. Data Services Limited.

Brookers. (2009) *Brookers Resource Management Law Handbook*. Wellington, NZ: Thomson Reuters.

Viessman, W., Hammer, M.J.(1993). *Water Supply and Pollution Control*. (5th Ed.). New York: Harper Collins.

Welch, E.B. (1992). *Ecological effects of Wastewater*. (2nd ed.). Cambridge Uni. Press.

Waitangi Tribunal Reports:

Waitangi Tribunal (1989). *Report of the Waitangi Tribunal on the Kaituna River Claim*. (2nd ed.). Wellington NZ: Waitangi Tribunal, Department of Justice.

Waitangi Tribunal (1989). *Motunui – Waitara Report Waitangi Tribunal 1983*. (2nd ed.). Wellington NZ: Waitangi Tribunal, Department of Justice.

Waitangi Tribunal (1989). *Report of the Waitangi Tribunal on the Manukau Claim*. (2nd ed.). Wellington NZ: Waitangi Tribunal, Department of Justice.

PROGRAMME CODE:	PROGRAMME TITLE:
TK0222	NZ Diploma in Engineering (Civil)
Course Descriptor	



COURSE CODE:	COURSE TITLE:
DCE6.651	CONTRACT ADMINISTRATION

WITT credit value: 12
Level: 6 Compulsory
Duration: 20 weeks
Internet based learning indicator: 2 - Web Supported

Learning hours:

Tutor contact hours	40
Self-directed hours	80
Total learning hours	120

Purpose:

To develop student understanding and expertise sufficient for them to evaluate and manage simple Civil Engineering contract documentation and administration details.

Learning outcomes:

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

NO	LEARNING OUTCOME
1.	Evaluate engineering contract law and documentation. 1.1 Apply the law of contract as it applies to engineering works. 1.2 Describe elements of formal contract documents relevant to civil engineering works. 1.3 Evaluate systems and types of contracts for civil works. 1.4 Define the requirements of the Resource Management Act 1991.
2.	Appraise tendering procedures and systems for a civil engineering project. 2.1 Describe systems for seeking and analysing tenders. 2.2 List the essential elements of a full set of tender documents. 2.3 Prepare tender documentation for a given engineering project.
3.	Prepare cost estimates of civil engineering projects. 3.1 Prepare schedules of quantities. 3.2 Determine estimating procedures for a range of situations. 3.3 Apply a cost estimating procedure for a given project. 3.4 Compile a report on civil engineering project costing estimates
4.	Apply computer technology and systems to solve a specified problem. 4.1 Analyse a specified problem using computer technology. 4.2 Describe options to solve a specified problem. 4.3 Design a computer macro to automate problem solving. 4.4 Create, test, document and demonstrate the application of a macro that automates processes within a computer application.

5.	<p>Complete a tender analysis and describe essential administration details for the engagement of a civil engineering contractor.</p> <p>5.1 Demonstrate knowledge of the process of dealing with tenders.</p> <p>5.2 Analyse tenders for a contract for civil engineering works and prepare a report on tenders.</p> <p>5.3 Select the preferred contractor and describe the essential administration details around advising interested parties.</p>
6.	<p>Describe the key processes for the administration of contracts on behalf of a client for implementation of a civil engineering contract.</p> <p>6.1 Demonstrate knowledge of the role of the engineer in the administration of a civil engineering project.</p> <p>6.2 Demonstrate knowledge of contractual processes for civil engineering works.</p> <p>6.3 Complete an end of work report for a simulated civil engineering contracts.</p>

Content/main topics:

Introduction to contract law, types of civil engineering contracts and contract documentation, including; tendering, sub-contractors, general conditions of contract, special conditions of contract, specifications. Estimating and costing. Contract administration. Application of computers in contract administration.

Basis of assessment:

All assessments in this course are achievement based. The Final Overall Mark will be the sum of the Coursework Mark and the Examination Mark as detailed below.

The Coursework Mark is the weighted sum of the test, assignment, project, etc, marks. Course Information sheets (issued at the start of each course) will detail the individual weightings and coverage of each assessment task and end of term examination.

Assessment requirements:

Component	Assessment Task	Coursework Mark %	Overall Weighting
Coursework	Controlled Assessments (e.g. Tests)	40%	50%
	Uncontrolled Tasks (Assignments, Project, etc)	60%	
	Total Coursework Mark	100%	
	(To pass you must achieve a Coursework Mark of at least 40%)		
Examination	Total Examination Mark	100%	50%
	(To pass you must achieve an Examination Mark of at least 40%)		
Overall Course	(To pass you must achieve a Final Overall Mark of at least 50%)		100%

Required texts:

None. Printed course notes are provided

Recommended reading:

Silyn-Roberts, H. (2000). *Writing for Science and Engineering*. Oxford: Butterworth-Heinemann.

NZS 3910:1998 *Conditions of Contract for Building and Civil Engineering Construction*. Wellington, NZ: Standards NZ.

Course Descriptor

WITT credit value: 12
Level: 6 Compulsory
Duration: 20 weeks
Internet based learning indicator: 2 - Web Supported

Learning hours:

Tutor contact hours	40
Self-directed hours	80
Total learning hours	120

Purpose:

To provide students with a good insight into the practicalities of sound civil engineering construction practice. To develop skills so that students can determine appropriate worksite layouts, equipment type and capacity, construction practices and methods for a range of typical construction projects.

Prerequisites:

No prerequisites are specified for this course.

Recommendations:

DCE4.457 Engineering Materials and DCE5.557 Traffic and Highway Engineering

Learning outcomes:

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

No	LEARNING OUTCOME
1.	Design an appropriate layout for a civil engineering construction site. 1.1 Describe the factors affecting site layout of temporary works, provision and protection of utility services, access and haul roads. 1.2 Evaluate the requirements for on site facilities. 1.3 Assess the constraints placed on site layout by health and safety considerations. 1.4 Prepare a traffic management plan.
2.	Determine the correct size and type of construction plant for a specified task. 2.1 Describe the main features and uses of a range of construction plant selected from the following: earthmoving, trenching, concreting, pumping and dewatering. 2.2 Determine the appropriate size and type of plant using manufacturer's data sheets for a range of construction plant selected from the following: earthmoving, trenching, concreting, pumping and dewatering.

3.	<p>Analyse the factors involved in earthmoving operations including retaining wall construction.</p> <p>3.1 Describe the effect of site topography and weather conditions on earthmoving methods.</p> <p>3.2 Evaluate earthmoving methods for differing types of soil.</p> <p>3.3 Describe and illustrate the types of retaining wall in common use in New Zealand including their limitations.</p> <p>3.4 List the sequence of construction operations required to construct the types of retaining walls described in 3.3 above.</p> <p>3.5 Prepare an environmental mitigation plan</p>
4.	<p>Determine the appropriate foundation system for a structure and describe the methods, plant and equipment needed for its construction.</p> <p>4.1 Assess the techniques and equipment used in the construction of differing types of shallow spread footings.</p> <p>4.2 Evaluate the techniques and equipment used in the construction of cofferdams and caissons.</p> <p>4.3 Evaluate the techniques and equipment used in the construction of pile foundations.</p> <p>4.4 Prepare a quality management plan</p>
5.	<p>Evaluate sound concreting practice.</p> <p>5.1 Describe the operations involved in mixing, placing, finishing and curing concrete.</p> <p>5.2 Explain the need for and the construction of the following joints in concrete: -construction, contraction and expansion.</p> <p>5.3 Describe formwork systems and reinforcing fixing.</p>
6.	<p>Evaluate methods of constructing underground pipe sewerage systems.</p> <p>6.1 Describe and illustrate the methods used for trench pipelaying for water supply, storm water and wastewater disposal systems including: - bedding, laying, jointing and backfilling pipelines.</p> <p>6.2 Describe the situations that are well suited to trenchless technology methods.</p> <p>6.3 Prepare a site safety plan</p>
7.	<p>Critically analyse construction practices</p> <p>7.1 Give an oral presentation using appropriate aids</p> <p>7.2 Critically evaluate the need for diarising construction events.</p> <p>7.3 Analyse a specific communication event in an intercultural situation</p> <p>7.4 Identify special rights of Maori in a range of engineering operations taking into account the Treaty of Waitangi.</p>

Content/main topics:

Construction site layouts, access and haul roads, utilities, site facilities, health and safety practices and regulatory requirements, construction plant, earthmoving, trenching, piling, roading, concreting, dewatering, retaining walls, foundation systems, coffer dams, caissons, piles, concreting and construction joints, formwork and reinforcing fixing, pipe laying, trenchless technology methods of constructing underground pipe systems.

Basis of assessment:

All assessments in this course are achievement based. The Final Overall Mark will be the sum of the Coursework Mark and the Examination Mark as detailed below.

The Coursework Mark is the weighted sum of the test, assignment, project, etc, marks. Course Information sheets (issued at the start of each course) will detail the individual weightings and coverage of each assessment task and end of term examination.

Assessment requirements:

Component	Assessment Task	Coursework Mark %	Overall Weighting
Coursework	Controlled Assessments (e.g. Tests)	40%	50%
	Uncontrolled Tasks (Assignments, Project, etc)	60%	
	Total Coursework Mark	100%	
	(To pass you must achieve a Coursework Mark of at least 40%)		
Examination	Total Examination Mark	100%	50%
	(To pass you must achieve an Examination Mark of at least 40%)		
Overall Course	(To pass you must achieve a Final Overall Mark of at least 50%)		100%

Required texts:

Nunnally S.W. (2006). *Construction Methods and Management*. (7th ed.). New Jersey: Prentice Hall. (ISBN 0-13-171685-9)

Recommended reading:

NZS 3109:1997 *Concrete construction*
 NZS 3124:1987 *Specification for concrete construction for minor works*
 NZS 4404:2004 *Land Development and Sub-division Engineering*.
Resource Management Act 1991 (Including amendments). Wellington: NZ Government.
Health and Safety in Employment Act 1991 (Including amendments). NZ Government.
 Occupational Safety and Health 1995,
 OSH (1995). *Approved Code of Practice for Safety in Excavation and Shafts for Foundations*. NZ: Occupational Health and Safety Service, Department of Labour.
 Transit New Zealand. (1989) *State highway pavement and rehabilitation manual*.
 Wellington: Transit New Zealand.
 Transit New Zealand (1991). *Working on the Road, A handbook for temporary traffic control and safety at roadwork sites*. Wellington: Transit New Zealand.
 Transit New Zealand (2000). *Code of Practice for temporary traffic management (COPTTM)*. Wellington: Transit New Zealand.
 InfraTrain NZ. (2000). *Operator Safety Manual*. Wellington: InfraTrain.
 Silyn-Roberts, H. (2000). *Writing for Science and Engineering*. Oxford: Butterworth-Heinemann.

PROGRAMME CODE:	PROGRAMME TITLE:
TK0222	NZ Diploma in Engineering (Civil)
Course Descriptor	



COURSE CODE:	COURSE TITLE:
DCE6.656	TRAFFIC ENGINEERING

WITT credit value: 18
Level: 6 Elective
Duration: 20 weeks
Internet based learning indicator: 2 - Web Supported

Learning hours:

Tutor contact hours	27
Self-directed hours	153
Total learning hours	180

Rationale for allocation of hours:

Reduced contact hours have been allocated to this course to encourage these final stage diploma students to take greater responsibility for directing their own learning.

Purpose:

To critically appraise urban traffic engineering concepts and procedures within the context of applying understanding of vehicle traffic flow, road hierarchy systems, intersections, traffic management techniques, facilities for non-vehicle road users and road safety analysis.

Prerequisites:

DCE5.557 Traffic and Highway Engineering

Learning outcomes:

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

NO	LEARNING OUTCOME
1.	Analyse the characteristics of vehicle traffic flow. 1.1 Describe the characteristics of traffic flows and evaluate traffic survey types for a range of situations. 1.2 Perform a traffic survey. 1.3 Evaluate methods of modeling traffic flows. 1.4 Demonstrate a method of modeling traffic flows.
2.	Apply road hierarchy system methods to access and movement functions. 2.1 Evaluate the Classical Road Hierarchy system. 2.2 Evaluate the effect of the 'Separate models' road hierarchy system. 2.3 Apply road classification systems to the design of road links and networks.

3.	Design Intersections 3.1 Evaluate methods of intersection control and treatment options. 3.2 Determine intersection layout. 3.3 Evaluate performance of layout options. 3.4 Produce final design for selected intersection form.
4.	Apply traffic management techniques. 4.1 Determine the traffic generation of adjacent land use developments. 4.2 Carry out a traffic impact assessment on a selected small isolated development. 4.3 Design a parking facility. 4.4 Evaluate methods of designing traffic calming facilities.
5.	Carry out road safety analysis. 5.1 Describe the principles and procedures in place for accident prevention and accident reduction in New Zealand. 5.2 Analyse the number, location, and types of crashes in accordance with the Land Transport Safety Authority Accident Investigation System (AIS) procedures. 5.3 Identify contributing factor commonalities at a given accident site. 5.4 Determine primary cause of the crashes at a given accident site. 5.5 Determine remedial measures to address the primary cause/s. 5.6 Introduction to road safety audit.
6.	Design traffic facilities for non-vehicle road users. 6.1 Identify types and characteristics of non-vehicle road users. 6.2 Evaluate methods of designing traffic facilities for non-vehicle road users. 6.3 List methods commonly used to reduce passenger vehicle usage including sustainable transport modes and alternatives to roading. 6.4 List advantages and disadvantages resulting from a decrease in vehicle usage.

Content/main topics:

Traffic flow characteristics, traffic surveys, levels of service, link capacity, road hierarchies, rural and urban road / streets, intersections, land use generators, parking facilities, traffic impact assessments, traffic calming facilities, vehicle crashes, accident sites, pedestrians, walkways, cycle-ways.

Basis of assessment:

All assessments in this course are achievement based. The Final Overall Mark will be the sum of the Coursework Mark and the Examination Mark as detailed below.

The Coursework Mark is the weighted sum of the test, assignment, project, etc, marks. Course Information sheets (issued at the start of each course) will detail the individual weightings and coverage of each assessment task and end of term examination.

Assessment requirements:

Component	Assessment Task	Coursework Mark %	Overall Weighting
Coursework	Controlled Assessments (e.g. Tests)	50%	50%
	Uncontrolled Tasks (Assignments, Project, etc)	50%	
	Total Coursework Mark	100%	
	(To pass you must achieve a Coursework Mark of at least 40%)		
Examination	Total Examination Mark	100%	50%
	(To pass you must achieve an Examination Mark of at least 40%)		
Overall Course	(To pass you must achieve a Final Overall Mark of at least 50%)		100%

Required texts:

None. Printed course notes are provided

Recommended reading:

Ogden, K.W, & Taylor, S.Y. (1996). *Traffic Engineering and Management*. Victoria, Australia: Institute of Transport Studies, Dept of Civil Engineering, Monash University.

AUSTROADS (1989). *Rural Road Design, Guide to the Geometric Design of Rural Roads*, Sydney, Sydney, Australia: Austroads Inc.

AUSTROADS (1995-2004) *Guide to Traffic Engineering Practice*. (Parts 1, 2, 5, 6, 7, 9, 13 & 14). Sydney, Australia: Austroads Inc.

AUSTROADS (1994) *Road Safety Audit*. Sydney, Australia: Austroads Inc.

NZS 4404:2004 *Land Development and Sub-division Engineering*. Standards NZ.

TNZ/MOT (1990). *Policy Guidelines for Traffic Accident Reduction and Prevention*.

TNZ/MOT (1991). *Accident Investigation Procedures*.

Transit NZ (1991). *RD1 Intersections at Grade*. Wellington: Transit NZ

Transit NZ (1991). *RD2 Roundabouts*. Wellington: Transit NZ

Akcelik, R. (1995) *Signalized Intersection: Capacity and Timing Guide*. ARR 123. Melbourne: Australia Road Research Board (ARRB)

Land Transport Safety Authority (LTSA) *Road Safety Guideline Publications - Various from RTS 1 to RTS 17*. Wellington: LTSA

Course Descriptor

WITT credit value: 18
Level: 6 Elective
Duration: 20 weeks
Internet based learning indicator: 2 - Web Supported

Learning hours:

Tutor contact hours	27
Self-directed hours	153
Total learning hours	180

Rationale for allocation of hours:

Reduced contact hours have been allocated to this course to encourage these final stage diploma students to take greater responsibility for directing their own learning.

Purpose:

To apply principles of road design, economic criteria and maintenance strategies to successfully plan, design, evaluate and maintain a roading alignment.

Prerequisites:

DCE5.557 Traffic and Highway Engineering

Learning outcomes:

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

No	LEARNING OUTCOME
1.	<p>Assess the feasibility of road and street location.</p> <ul style="list-style-type: none"> 1.1 Define project objectives, the problem to be solved. 1.2 Identify and define the required project standards. 1.3 Identify geographic features, physical and social and environmental constraints. 1.4 Develop a concept layout for an alignment.
2.	<p>To design flexible and rigid roading pavements given existing traffic flows, a projected growth rate and subgrade test results.</p> <ul style="list-style-type: none"> 2.1 Illustrate the typical roading pavement types and makeup of materials. 2.2 Demonstrate knowledge of the mechanics and testing methods of road pavements. 2.3 Determine the design traffic loading of a pavement. 2.4 Develop designs for flexible and rigid roading pavements based on subgrade strength and design parameters. 2.5 Determine requirements and methods for pavement rehabilitation.

No	LEARNING OUTCOME
3.	To design flexible and rigid pavement surfacings given correct design data. 3.1 Identify principles of pavement surfacing. 3.2 Describe surfacing types and their performance expectations. 3.3 Design a bitumen seal construction application rate given climatic, geographic and material property parameters. 3.4 Design a concrete pavement surface with and without reinforcing.
4.	Evaluate a roading project using TNZ Simplified Procedures. 4.1 Describe methods of evaluation of roading projects. 4.2 Define and calculate the benefit to cost ratio of a roading project. 4.3 Determine the intangible effects of a roading project.
5.	Evaluate the requirements for ancillary services for roading networks. 5.1 Describe signage types, requirements and location for roads. 5.2 Define types, characteristics, requirements and locations of road markings for roads. 5.3 Apply temporary traffic management procedures. 5.4 Identify types, levels and locations of street lighting. 5.5 Describe procedures for protecting, locating and designing street features in conjunction with utility services.
6.	Develop a road maintenance strategy. 6.1 Quantify the asset. 6.2 Determine the condition of the asset. 6.3 Determine the road performance criteria. 6.4 Develop a maintenance strategy.

Content/main topics:

Road feasibility studies, physical, social and environmental constraints, road design, flexible and rigid pavements, surfacings, economic evaluation, signs, road marking, temporary traffic control, street lighting, utilities, maintenance strategies.

Basis of assessment:

All assessments in this course are achievement based. The Final Overall Mark will be the sum of the Coursework Mark and the Examination Mark as detailed below.

The Coursework Mark is the weighted sum of the test, assignment, project, etc, marks. Course Information sheets (issued at the start of each course) will detail the individual weightings and coverage of each assessment task and end of term examination.

Assessment requirements:

Component	Assessment Task	Coursework Mark %	Overall Weighting
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	Total Coursework Mark	100%	
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Examination	Total Examination Mark	100%	50%
	(To pass you must achieve an Examination Mark of at least 40%)		
Overall Course	(To pass you must achieve a Final Overall Mark of at least 50%)		100%

Required texts:

None. Printed course notes are provided

Recommended reading:

NZS 4404:2004 *Land Development and Sub-division Engineering*. Standards NZ.
NZS 6701:1983 *Code of Practice for Road Lighting*. Wellington: Standards NZ.
AUSTROADS (1989), *Rural Road Design, Guide to the Geometric Design of Rural Roads*. Sydney, Australia: Austroads Inc.
AUSTROADS, 1992. *Pavement Design. A guide to the Structural Design of Road Pavements*. Sydney, Australia: Austroads Inc.
TNZ (1989) *State Highway Pavement & Rehabilitation Manual*. Wellington: Transit NZ.
TNZ (1991) *Bituminous Sealing Manual*. Wellington: Transit NZ.
TNZ (1992) *Project Evaluation Manual, Vol 1: Simplified Procedures*. Transit NZ.
TNZ / LTSA (1992) *Manual of Traffic Signs and Markings, Parts I and II*. Transit NZ.
TNZ (1991) *Working On the Road, Handbook for Temporary Traffic Control*. Transit NZ.
NZIHT (1999) *RAMM Treatment Selection Workshop Manual*. Wellington: Transfund NZ.
NZ Transport Agency (1996). *State Highway Database Operations Manual*. Transit NZ.
Transfund NZ. (1997) *RAMM Road Condition and Roughness Rating Manual PFM6*. Wellington: Transfund NZ.