

TRINITY INTERNATIONAL UNIVERSITY

presents the

GENERAL AND AVAILABLE DEGREE PROSPECTUS

for the

B Sc (Hons) in Structural Engineering

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1. GENERAL INFORMATION

ABOUT THE DEGREE PROGRAMS

Specially prepared by

**Professor Dr J Potgieter
Course Director
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These undergraduate and postgraduate degree courses have been specially prepared for distance learning purposes and are intended to fill the special needs for the university. Students will be entitled to receive credit for life-work experience based on the norms and standards set by CAEL and previously completed studies at recognized academic institutions under the University's accreditation for prior learning program.

Undergraduate degree programs are designed for students who wish to pursue a scientific related program in either the scientific or managerial science fields of endeavor.

These programs are designed and have been compiled from sources and materials NOT RELATED to any existing degree programs offered anywhere. The textbooks selected and syllabuses are based according to the latest materials, developments, technologies and systems applicable in the field of endeavor.

All courses are textbook related and suitable assignments and examinations are set for each course to be completed by students. Where applicable, fieldwork and practical work will be prescribed. Theses and assignments must follow the usual format and structure requirements set by each faculty.

2. DEGREE SUPERVISORS

Under the guidance of Prof Dr J Potgieter PhD (Eng), PhD (Aviation Science), D Lit, D Sc (hc), PhD (Bus Admin), D Eng (Industrial Eng) the following programs are supervised:

B Sc (Hons) Industrial Engineering (Electrical and Mechanical Majors)
 B Sc (Hons) Agricultural Science
 B Sc (Hons) Agricultural Engineering
 B Sc (Hons) Agricultural Management
 B Sc (Hons) Hydrological Science
 B Sc (Hons) Mechatronics Engineering
 B Sc Forensic Science
 M Sc Forensic Science

Under the guidance of Prof S M Keong PhD(Eng), PhD (Eng Mgt), D Sc (Concrete), M Sc (Civil Eng), M Sc (Geot Eng), C Eng, MICE, MIEE, MCIOB, FBEng, FSE, C Math the following programs are supervised:

B Sc (Hons) Structural Engineering
 B Sc (Hons) Concrete Technology
 B Sc (Hons) Soil Science Technology

Under the guidance of Professor Dr S Grima B Com, B Com (Hons), M Sc (Fin Man), M Sc (Accountancy), PhD (Finance), FIPFM, FDTMS, FIAB, AFA the following program is supervised:

M Sc Financial Management

3. ENROLLMENT INFORMATION AND COURSE FEES

Here are the fees for the available degrees:

Degree	Cost
Associate Degree (as separate degree or part of Bachelors Degree):	\$1800-00 USD
Bachelors Degree (excluding associate degree)	\$1800-00 USD
Bachelors Degree (including Associate Degree)	\$3600-00 USD
Masters Degree	\$2600-00 USD
PhD (in any approved field of research)	\$3600-00 USD

Textbooks are NOT included and are separately quoted. Costs depend on the nature of the program, exemption granted as well as courier/transportation and importation/tax fees applicable to the student's country of residence.

PAYMENT METHODS

We accept: Personal checks, bank drafts, electronic transfer and credit card payments. Payment by means of installments must be arranged.

ENROLLMENT DETAILS AND ADDRESS

Internet enrollments are possible on our website at: www.trinityinternationalcu.com by following the instructions. Applicable fees are payable by means of a personal check, draft, direct transfer or credit card payments. We accept installments and any approved arrangements for payment of fees.

5. COURSE STRUCTURE

The programs have been structured to ensure they are suitable to any organization or person anywhere in the world. Students will be able to commence with their studies any time of the year. The programs are structured to allow a) students without a high school diploma or b) mature students to study up to the highest degree level. Students without the usual entrance level qualification, but with acceptable basic knowledge are welcome to apply and will be able to study their intended program from first principles. Bridging courses will be prescribed to ensure that the student has the required level of knowledge. Many introductory courses have enough scope and are of such nature, which allows students to advance up to degree level and prepare students for more advanced level work.

OVERVIEW

Objective

The programs are designed for students who wish to study their field of interest most suitable to them. The course programs are suitable for students anywhere in the world and will be complimented with fieldwork, practical requirements and coursework as well as assignments most suitable to the needs of each student. Where applicable, courses will be adapted for special needs on topics, study areas and research areas not included as listed in the various programs. These programs are suitable for distance education or campus learning centers approved by the Course Director. The purpose is also to enable students to acquire the knowledge and theoretical understanding with skills to equip them to advance from basic principles to the higher level in their fields of study. We further strive to provide the mature candidate whom has gained acceptable training, education and experience, an acceptable method to advance to the higher degree levels in his/her career. Our third aim is to ensure that candidates develop their professional careers and gain acceptance through membership or certification or by joining international or local professional institutions.

ENTRY METHOD (as indicated on the [Admissions Page](#))

- A suitable school level certificate (to advance through studies to senior school certificate level), or
- A senior school leaving certificate/diploma for degree candidates
- Mature students with suitable training and experience

EXEMPTIONS (as indicated on the [Admissions Page](#))

Students with completed courses, certificates, diplomas or degrees will be considered for exemption. Partial exemption may be granted where applicable. Additional coursework will be prescribed, to complete the outstanding coursework in question in order to gain full credit for each course where applicable.

DURATION

No time limit is set but as a guide the usual durations are:

Associate degrees - from one to two years

Bachelor's degree programs - from two to four years

Master's degree programs - from one to two years

Doctorates - from two to three years, depending on the amount of work involved.

LEARNING METHODS

- Coursework requirements assignments
- Textbook related studies, notes and articles,
- Fieldwork, research, practical work assignments
- Learning sources such as libraries, Internet and dedicated learning sources

METHOD OF ASSESSMENT

Assignments, projects, independent projects, examinations and independent theses or projects and dissertations as applicable to assess student professionalism.

TEXTBOOKS

Textbooks are prescribed for each course. Where applicable additional learning sources available on the Internet will be utilized. The Course Director will assist students with the arrangement and ordering of textbooks. An estimate will be given to students giving the cost for the textbooks related to his/her studies. Students are responsible for additional study aids, notepads and any other equipment required to study efficiently. A complete reading list will be given for each degree programs upon successful admission to your program of choice.

6. STUDENT DOCUMENTATION

All students at all degree levels will receive the following:

- Information about the required textbooks.
 - Study instructions and assignments.
 - Coursework and fieldwork as required.
 - Syllabus details for each course.
 - Student handbook – basic study requirements and information
 - Student guidelines on how to prepare assignments, theses, proposals and dissertations.
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8. DEGREE COURSES

B Sc (Hons) IN STRUCTURAL ENGINEERING

Common Engineering Courses

ENG201	Engineering Chemistry
ENG001	Engineering Mathematics (Calculus I)
ENG004	Engineering Mathematics (Calculus II)
ENG006	Engineering Mathematics (Advanced Algebra and Differential Applications)
ENG102	Applied Computer Programming (Matlab)
ENG002	Applied Mathematics (Statics)
ENG005	Applied Mathematics (Dynamics)
ENG105	Applied Mathematics (Statistics and Probability)
ENG003	Engineering Physics
ENG103	Engineering Drawing

Core Courses Section 1

CIV001	Surveying I
CIV107	Surveying II
EEL101	Electrotechnics (Circuit Analysis)
ENG202	Strength of Materials I
MEG006	Strength of Materials II
CIV106	Strength of Materials III
CIV102	Geology
CIV103	Building Materials Science I
CIV125	Building Material Science II
SET01	Structural Dynamics
SET04	Structural Vibrations
SET/CIT17	Theory of Structures
CIV104	Geotechnics I
CIV108	Geotechnics II
CIV114	Geotechnics III
SET/CIT08	Geo-Technical Engineering
SET/CIT03	Concrete Technology
SET/CIT18	Reinforced Concrete Design

Optional Course Section 1: Select any four courses from -

SET/CIT06	Structural Design
SET/CIT12	Steel Construction
SET/CCT02	Pre-Stressed Concrete Structures
SET02	Fracture Mechanics
SET03	Theories of Elasticity
SET/CIT07	Structural Reliability Analysis

Optional Course Section 2: Select any two courses from –

SET/CNT12	Construction Project Management
SET/CNT07	Construction Contracting
SET/CNT04	Construction Planning
SET/CNT11	Construction Safety

9. DEGREE SYLLABUS

9.1 GENERAL INFORMATION

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GENERAL NOTES AND INFORMATION APPLICABLE TO EACH COURSE

Pre-requisites

Will be stated if required, but as a guide the structure of the courses and the sequence determine the basic requirements in each case. Usually, mathematics, physics and chemistry are the major tools and form the basic in each case for each program. This is followed by courses required in each case to fulfil the needs for successful completion during the entire study process.

Number of Credits: 3

Hours Assigned:

2 hours/week x 14 weeks or the equivalent via distance learning = 28 hours

Laboratory/practical:

2 hours/week x 7 weeks or its equivalent via distance learning = 14 hours

Total = 42 hours

Contents:

Each course contents are listed below and the general notes and information is applicable to each program.

Objectives A: The subject syllabus provide students with -

- 1 The basic skills for analyzing and improving working methods, procedures and systems in the context of the workstation and a department taking into account ergonomic considerations so that they are able to carry out a production management project in a company for the purpose of management and productivity improvement.
- 2 Skills in the use of compilation of work measurement data and to have a basic understanding of the techniques and importance of qualifying work in manufacturing and service industries hence to be able to measure the work content
- 3 A working knowledge of the techniques of facilities layout and their interaction with the material handling system (where relevant), to enable them to evaluate an existing production system and recommend improvements and/or to plan a new system.

Objectives B: The subject aims to -

- 1 Provide students with an understanding of the basic principles and techniques involved in management of people and engineering in the production of goods and services.
- 2 Enable students to appreciate the importance of quality management.
- 3 Ensure students are aware of the effects on engineering organizations of the factors in the environment within which they operate.

Objectives C: Provide students with -

- 1 The ability to perform research, use the knowledge obtained from each course of the program and to compile and sort the information obtained.
- 2 To be able to use the knowledge obtained to write the research project and to use proper methods, language and techniques to complete the task. Be able to use computer packages and software for the preparation of research projects and reports.

Teaching and Learning Approach:

A mixture of lectures, tutorial exercises and case studies will be used to deliver the various topics in the subject. Some will be covered in a problem-based format where this enhances the learning objectives. Others will be covered through directed study in order to enhance the student's ability of what to learn. Some case studies, largely based on consultancy experience, will be used to integrate these topics and thus demonstrate to students how the various techniques are inter-related and how they apply in real situations.

Assessment:

Coursework - 40%
Examination - 60%

Textbooks and References:

Listed separately for convenience and reference.

9.2 SPECIFIC DEGREE SYLLABUS

B Sc (Hons) IN STRUCTURAL ENGINEERING

Common Engineering Courses

ENG201 - Engineering Chemistry

Basic principles; Atomic structure and chemical bonding; reactions in aqueous medium; Precipitation and complex formation and redox; Gases; Thermo-chemistry; Engineering applications of chemical equilibrium and kinetics in corrosion; Combustion; Welding and water treatment; Inorganic and organic polymers.

ENG001 - Engineering Mathematics (Calculus I)

Mathematical induction and the binomial theorem; Functions; Limits and continuity; Derivatives and rules for differentiation; Applications of differentiation; Integration; The definite and indefinite integral; Integration of simple functions.

ENG004 - Engineering Mathematics (Calculus II)

Transcendental functions; Integration techniques; Improper integrals; Conic sections; Polar co-ordinates; Partial derivatives; Complex numbers; Introduction to matrices and determinants.

ENG006 - Engineering Mathematics (Advanced Algebra and Differential Applications)

Ordinary first order differential equations; Linear higher order differential equations; Infinite series and Taylor's theorem.

ENG102 - Applied Computer Programming (Matlab)

Introduction to structured programming language; Arithmetic and logic; Program flow control; Sub-program procedures and function procedures; Data types – arrays; Sets and records; Graphics; Practical applications to engineering problems; Emphasis on modular programming for engineering applications.

ENG002 - Applied Mathematics (Statics)

Vectors; Forces; Sum of forces at a point; Direction cosines and direction angles; Components and component vectors; Scalar product; Vector product; Moment of a force; Force system on rigid bodies; Equivalent force systems; Couples; Line of action of resultant; Equilibrium of a rigid body; Trusses; Friction; Center of mass; Kinematics in one dimension.

ENG005 - Applied Mathematics (Dynamics)

Derivatives and integrals of vectors; Kinematics in one, two and three dimensions; Relative velocities; The laws of motion in a straight line with constant forces; the harmonic oscillator; Forces in the plane; Parabolic motion in a circle and other plane curves; The principle of work and energy; Power; Conservation laws; Energy; Momentum and impulse; Angular momentum; The rigid body; Determination of mass and center of mass; Rigid body kinematics; Moments of inertia; Rigid body translation, rotation about a fixed axis and motion parallel to the plane.

ENG003 - Engineering Physics

Geometrical optics; Principles of mechanics and heat; Properties of wave motion and the application thereof to different types of waves; Introduction to the microscopical description of matter and the implications of atomic and nuclear structure for properties of matter.

ENG103 - Engineering Drawing

Projection planes; Points; Lines and planes in space; Trace points of lines and trace lines of planes; True lengths and true angles between lines and planes; True angles between planes; New projection planes; Shadows; Interpenetrations; Developments; Isometric projections; Works drawings; 1st and 3rd angle projections; Line alphabet; Dimensioning; Scale view drawing layout; Auxiliary views; Hidden detail; Sections and cross-hatching.

Core Courses Section 1**CIV001 - Surveying I**

Background; Legislative information; Cadastral information; Theory and practical aspects; Coordinate systems; Optical, plane and theodolite traversing; Plane table surveying and leveling; Measurement of areas and volumes; Profiles and longitudinal sections; Contouring; Tachometry and GPS.

CIV107 - Surveying II

Photogrammetry; Earthwork; Setting out works; Setting out curves; Instruments and electronic systems; Underground surveying; Hydrographic surveying; Practical applications.

EEL101 - Electrotechnics (Circuit Analysis)

Elementary electrical circuit laws, theorems and circuit analysis; Power and energy; The electrostatic field; Capacitance and elementary RC-circuits; Magnetism and magnetic circuits; Electromagnetism, self – and mutual induction and elementary RL – circuits.

ENG201 - Engineering Chemistry

Basic principles; Atomic structure and chemical bonding; reactions in aqueous medium; Precipitation and complex formation and redo; Gasses; Thermo-chemistry; Engineering applications of chemical equilibrium and kinetics in corrosion; Combustion; Welding and water treatment; Inorganic and organic polymers.

ENG202 - Strength of Materials I

Basic concepts; Axial forces; Bending moments and shear forces; Stresses and deformations due to axial forces; Bending moments and shear stresses; Stresses as shear forces and deformations due to torsion of round bars.

MEG006 - Strength of Materials II

Stresses and strains; Relationship between stresses and strains; Transformation of stresses and strains; Bending stresses in initially curved beams; Torsion; Yield theory; Stress concentrations and fatigue.

CIV106 - Strength of Materials III

Displacement of beams; Statically independent elements; Energy methods; Stability of structural elements.

CIV102 - Geology

Origin and development of the earth; Minerals; Igneous rocks; Sedimentary rocks; Metamorphic rocks; Engineering properties of rocks; Elements of soil mechanics; Rock weathering and soils; Stratigraphy and geologic time; Structural geology; Running water; The work of glaciers; Physiographic provinces and engineering aspects; Landslides, subsidence and slope stability; Ground water geology; Coastal processes and landform features; Earthquakes and geophysics; Subsurface investigation and site selection; Arid environments and wind; Engineering geology and environmental geology.

CIV103 - Building Materials Science I

Introduction; Building stones; Bricks and other clay products; Lime; Cement; Mortar; Concrete; Timber and wood products; Metals and alloys; Paints, varnishes, distempers and anti-termite treatment; Asphalt; Bitumen and tar; Asbestos, adhesives and abrasives.

CIV125 - Building Material Science II

Plastics and fibers; Glass; Insulating materials; Fly-ash, gypsum and gypsum plaster; Rubber and composite materials; Lubricating, belting and packaging materials; Cutting tool materials; Electrical engineering; Material science of metals.

SET01 - Structural Dynamics

Single degree of freedom linear response; Two degree of freedom linear response; Multi-degree of freedom linear response; Earthquake response of structures; Response spectra analysis; Non-linear time history analysis; Special topics in structural dynamics; Base isolation; Manufactured viscous dampers; Structural control; References.

SET04 - Structural Vibrations

Introduction; Vibration of structures having one degree of freedom; Free un-damped vibration; Free damped vibration; Forced vibration; Vibration of structures with one degree of freedom, more than one degrees of freedom; Modal analysis techniques; Vibration of continuous structures – longitudinal vibration of a thin uniform beam; Transverse vibration of a thin uniform beam; Analysis of continuous structures by Rayleigh's energy method; Transverse vibration of thin uniform plates; The finite element method; The vibration of beams fabricated from more than one material; Damping in structures – sources of vibration excitation and isolation; Vibration isolation; Structural vibration limits; Structural damage; Effects of damping on vibration response of structures; The measurement of structural damping; Sources of damping; Active damping systems; Energy dissipation in non-linear structures.

SET/CIT17 - Theory of Structures

Introducing structures, Plane statics, Statically determinate structures, Stress and strain, Bending of beams, Torsion and shear, Virtual work and influence lines, Moment distribution, The stiffness matrix model, The finite element method, Buckling and instability, Plastic analysis of structures, Structural dynamics.

SET/CIT03 - Concrete Technology

Fresh Concrete: Rheology of concentrated suspensions, pastes, mortars and concretes, workability, segregation and bleeding, theory and principles governing the correct placing and compaction of concrete

Setting and Hardening Concrete: plastic settlement and plastic shrinkage; exothermic characteristics, early age thermal movements, curing

Properties of Hardened Concrete: Strength, deformation under load, elasticity, creep,

drying shrinkage and other volume changes, thermal properties

Durability of Concrete and Concrete Construction: Durability concepts, pore structure and transport processes, reinforcement corrosion, fire resistance, frost damage, acid, soft water and sulphate attack, delayed ettringite formation, Alkali silica reaction of providing durable concrete, short-term tests to assess long-term behavior, specifying and achieving cover to reinforcement.

CIV104 - Geotechnics I

Structural geology; Mass movement; Construction site case studies; Particle size analysis; Plasticity; Soil classification; Phase compaction; Soil water; Permeability; Seepage theory; Flow nets; Filter design; Effective stress; Seepage force.

CIV108 - Geotechnics II

Mohr-Coulomb shear strength theory; Shear strength testing on sand and clay; Stress paths; Critical state theory; Pore pressure coefficients; Elastic stresses; Elastic settlement; Lateral earth pressure; Gravity retaining walls; Sheet pile walls; Excavation bracing.

CIV114 - Geotechnics III

Consolidation settlement; Settlement rate; Bearing capacity of shallow foundations; Settlement on sand; Bearing capacity of piles and pile groups; Ground anchors; Slope stability analysis; Ground investigation.

SET/CIT08 – Geo-Technical Engineering

Soil deposits and grain size analysis, Weight-volume relationships, plasticity and soil classification, Soil compaction, Movement of water through soil-hydraulic conductivity and seepage, Stresses in soil mass, Consolidation, Shear strength of soil, Sub-surface explorations, Lateral earth pressure, Slope stability, Shallow foundations bearing capacity and settlement, Retaining walls and braced cuts, Deep foundation piles and drilled shafts, References.

SET/CIT18 - Reinforced Concrete Design

Materials and mechanics of bending; Rectangular concrete beams and slabs – tension steel only; Reinforced concrete beams – T-beams and doubly reinforced beams; Shear in beams; Development, splices and simple-span bar cutoffs; Continuous construction design considerations; Serviceability; Walls; Columns; Footings; Pre-stressed concrete fundamentals; Concrete formwork; Detailing reinforced concrete structures; References.

Optional Course Section 1: Select any four courses from -

SET/CIT06 - Structural Design

Introduction to building structures; Basic structure concepts; Approximate structural design of common timber member types; The lateral stability of buildings; Frames, arches and trusses; Space frames; Folded plate structures; Shell structures; Tension roof structures; High-rise building structures; References.

SET/CIT12 - Steel Construction

Part I: Introduction; Properties of structural steel; Welding; Riveting and bolting; Tension members; Compression members; Simple beams; Plate girders; Beam columns; Gantry girders; Column caps and base-plates; Loads; Wind loads on industrial buildings; Braced industrial buildings; Unbraced industrial buildings; Frames; Tower buildings; Introduction to plastic design; Design of water steel vessels; Steel bridge design; References.

Part II: General considerations; Wind effects; Lateral systems – Steel buildings; Lateral bracing systems for concrete buildings; Lateral systems for composite construction; Gravity systems for steel buildings; Gravity systems in concrete buildings; Composite gravity systems; Analysis techniques; Structural design; Special topics; References.

SET/CCT02 - Pre-Stressed Concrete

Basic concepts; Materials and systems for pre-stressing; Partial loss of pre-stress; Flexural design of pre-stressed concrete elements; Shear and torsional strength design; Indeterminate pre-stressed concrete structures; Camber, deflection and crack control; Pre-stressed compression and tension members; Two-way pre-stressed concrete floor systems; Connections for pre-stressed concrete elements; Pre-stressed concrete circular storage tanks and steel roofs; LRFD and standard AASHTO design of concrete bridges; Seismic design of pre-stressed concrete structures; References.

SET02 - Fracture Mechanics

Introduction; Structure and deformation in materials; A survey of engineering materials; Mechanical testing: tension test and other basic tests; Stress-strain relationships and behavior; Review of complex and principal states of stress and strain; Yielding and fracture under combined stresses; Fracture of cracked members; Fatigue of materials: introduction and stress-based approach; Stress-based approach to fatigue: notched members; Fatigue crack growth; Plastic deformation behavior and models for materials: Stress-strain analysis of plastically deforming members; Strain-based approach to fatigue; Time-dependent behavior: creep and damping; References.

SET03 - Theories of Elasticity

Orientation and review of elementary mechanics of materials; Stress, Principal stresses, strain energy; Failure and failure criteria; Applications of energy methods; Beams on an elastic foundation; Curved beams; Elements of theory of elasticity; Pressurized cylinders and spinning disks; Torsion; Unsymmetrical bending and shear center; Plasticity in structural members – collapse analysis; Plate bending; Shells of revolution with axis-symmetrical loads; Buckling and instability; References.

SET/CIT07 - Structural Reliability Analysis

Measures of reliability analysis, Structural reliability assessment, Integration methods, Monte Carlo simulation, Second-moment and related methods, Structural systems, Time dependent reliability, Load and load effect modeling, Resistance modeling, Codes and structural reliability, Summary of probability theory, References and information.

Optional Course Section 2: Select any two courses from –

SET/CNT12 - Construction Project Management

Construction practices, The management system, Project estimation, Project planning, Project scheduling, Production planning, Project time reduction, Resource management, Project time management, Project cost management, Financial management, Schedule applications, References.

SET/CNT07 - Construction Contracting

The construction industry, Business ownership, Company organization, Drawings and specifications, Cost estimation and bidding, Construction contracts, Contract survey bonds, Construction insurance, Business methods, Project management and administration, Project cost management, Project time management, Labor law, Labor relations, Project safety.

SET/CNT04 - Construction Planning

Introduction, Planning for equipment utilization, Equipment cost, Geo-technical materials, composition and stabilization, Machine power, Dozers, Scrapers, Excavators, Finishing equipment, Trucks and hauling equipment, Compressed air, Drilling rock and earth, Blasting rock, Aggregate production, Asphalt mix production and placement, Concrete equipment, Cranes, Draglines, References.

SET/CNT15 - Construction Safety

Introduction, Injury accidents and their causes, When do injuries occur? The true costs of construction worker injuries, Occupational safety and similar acts, Problem areas in construction safety, Elements of an effective safety program, Job-site safety assessment, Safety meetings, Safety incentives, Safety in construction contracts, Substance abuse, Safety record keeping, Safety culture, Safe workers, Safety and first-line supervisors, Safety and middle managers, Top management practices, Company activities and safety, Safety personnel, Sub-contractor safety, Project co-ordination and construction safety, Owners and construction worker safety, Designer influence on construction worker safety.