

TRINITY INTERNATIONAL UNIVERSITY

presents the

GENERAL AND AVAILABLE DEGREE PROSPECTUS

for the

B Sc (Hons) in Industrial Engineering – Mechanical Branch

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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 INDUSTRIAL ENGINEERING – MECHANICAL BRANCH

Common Engineering Courses

ENG201	Engineering Chemistry
ENG001	Engineering Mathematics (Calculus I)
ENG004	Engineering Mathematics (Calculus II)
ENG006	Engineering Mathematics (Advanced Algebra and Differential Applications)
ENG105	Applied Mathematics (Statistics and Probability)
ENG102	Applied Computer Programming (Matlab)
ENG002	Applied Mathematics (Statics)
ENG005	Applied Mathematics (Dynamics)
ENG103	Engineering Drawing
ENG003	Engineering Physics
ENG104	Engineering Design Philosophy

Core Course Section 1

ENG202	Strength of Materials I
MEG006	Strength of Materials II
MEG001	Machine Drawing
MEG002	Thermodynamics
MEG003	Materials Science I
MEG004	Workshop Technology
MEG005	Theory of Machines
MEG007	Fluid Mechanics I
MEG008	Computer Aided Engineering
IND012	Mechatronics
EEL101	Electrotechnics (Circuit Analysis)
EEL112	Electrical Energy Systems II (Electrical Machines)
MEG010	Numerical Methods
IND005	Control Engineering
IND007	Industrial Ergonomics
IND008	Informatics

Core Courses Section 2

IND001	Industrial Management I
IND004	Industrial Management II
IND009	Industrial Management III
IND006	Manufacturing Processes
IND007	Industrial Ergonomics
IND002	Industrial Programming I
IND010	Industrial Programming II
IND003	Decision Theory I
IND011	Quality Assurance I
IND014	Quality Assurance II
IND012	Mechatronics
IND013	Simulation
IND015	Manufacturing Systems

Core Course Section 3: Compulsory Courses

IND016	Engineering Management
IND017	Engineering Economics
MEG021	Project (Mechanical)

Electives: select 3 courses from:

MEG014	Machine Design
MEG020	Heat Transfer
ENG016	Maintenance Technology
IND018	Reliability Engineering
IND019	Combustion Engineering
IND020	Engineering Tribology

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 COMMON ENGINEERING COURSES**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.

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 (Static's)

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.

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.

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.

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.

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.

ENG104 - Engineering Design Philosophy

Impact of technology on society; Influence of culture on worldview; The role of information technology; Ethics in engineering; Philosophy of science; Science and culture.

ENG006 - Engineering Mathematics (Advanced Algebra and Differential Applications)

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

ENG007 - Engineering Mathematics (Vector Analysis)

The straight line and the plane; Space curves; derivatives and integrals of vectors; curves; the unit tangent; Arc length; Surfaces; Partial derivatives of vectors; The gradient vector; Vector fields; Vector differential operators; Line integrals; Gradient fields; Surface integrals in the plane; Green's theorem; Surface integrals in space; Centers of mass and moments of inertia; Stoke's theorem; Volume integrals; Center of mass and moments of inertia; Gauss' divergence theorem; Center of mass and moments of inertia of 1-, 2-, and 3-dimensional bodies.

ENG106 - Applied Mathematics (Linear Algebra)

Vectors and matrices; Solution of linear equations; Vector spaces and subspaces; Orthogonality; Determinants; Eigen-values and eigenvectors; Linear transformations; Numerical linear algebra.

ENG007 - Engineering Mathematics (Complex Variables and Fourier Analysis)

Differentiation and integration of complex function; Cauchy's integral formula and applications; Fourier series; Fourier integrals and transforms; Bessel functions; Partial differential equations and separation of variables.

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.

COMMON COMPULSORY COURSES - ALL ENGINEERING DISCIPLINES

EEL126 - Engineering Management

Aspects of management practice including planning, organizing, staffing and training; Leadership and control; Management of matrix organizations consisting of line and project functions and speciality staff; Project management and engineering and new product development techniques; Industrial psychology; Motivation, leadership creativity and entrepreneurial behaviour; Social responsibility and ethics.

EEL127 - Engineering Economy

Introduction to accounting; Balance sheet; Profit and loss account; Cash flow statements; Ratio analysis and interpretation of financial statements; Manufacturing cost analysis; Time value of money; Discounting techniques; Economic analysis of investment proposals; Taxation influence after tax analysis.

9.3 SPECIFIC DEGREE SYLLABUS

B Sc (Hons) IN INDUSTRIAL ENGINEERING – MECHANICAL BRANCH

IND005 - Control Engineering

Block diagram algebra; Classical and state space approach to modeling of dynamic systems; Industrial controllers and steady state behavior; Root locus methods; Frequency response analysis; Practical applications and use of a computer package.

IND008 - Informatics

Introduction to engineering computing; Basic elements of a programming language; Object orient modeling of engineering systems; Algorithms and data structures for modeling engineering networks.

IND007 - Industrial Ergonomics

Method supply; Reduction of setup times; Process charts; Multiple activity charts; Time study; Rating; Allowances; Activity sampling; Predetermined motion-time systems; Standard time data; Training and learning curves; Anthropology; Work station and tool design; Man-machine interfaces; Work physiology and biomechanics; Manual materials handling; posture; Lighting, noise, climate and toxicology; Shift work; Ergonomic criteria of the occupational health and safety act.

IND001 - Industrial Management I

Introduction to operations management; The design of goods and services; Break-even analysis; Inventory control; MRP; Facilities layout; Materials handling equipment; Warehouse design; Line balancing; Capacity planning; Facilities design and layout strategy.

IND004 - Industrial Management II

Operations management; The planning and control of the transformation process within the framework of different manufacturing and service delivery philosophies; Capacity planning and location strategy; Tactical production planning and short-term scheduling techniques; Aspects of production planning and control will be integrated in a formal structured ERP-system with the development of a feasible production schedule.

IND009 - Industrial Management III

The subject of two parts namely the financial management of enterprises and practical aspects of practicing engineering; Financial management covers aspects such as macro-economic principles, supply, demand and price equilibrium; The capital structure of an enterprise and analysis of financial information; Manufacturing cost analysis and budgets; Engineering practice will be studied with the aid of diagnostic case studies; Special emphasis is placed on legislation affecting companies and labor relations.

IND002 - Industrial Programming I

Word processing; Use of spreadsheets; Numerical methods; Basic financial calculations; Planning and analysis of scenarios; Basic computer communication; Theory of forecasting with emphasis on spreadsheet applications.

IND010 - Industrial Programming II

Computer aided analysis of variance; Experimental design and multiple regression.

IND003 - Decision Theory I

The systems approach to problem solving; Problems leading to linear programming; Network; Integer and non-linear programming; Algorithms for solving such models; Tasks including computer packages.

IND011 - Quality Assurance I

Definition of quality; Quality assurance methods and techniques; Statistical process control; Observation and monitoring of production processes; Sampling plans; Metrology; Measurement and inspection processes; Planning of measurement and inspection operations with automated CNC or CMM machines.

IND014 - Quality Assurance II

Definition of reliability and maintainability; Reliability management; Methods and techniques for reliability modeling; Allocation; Prediction and maintainability assurance; Fault tree analysis; Failure mode analysis; Quality management; History and background; ISO 9000; Total quality management; 6-sigma; Cost considerations; Quality audits; ISO 14000.

IND012 - Mechatronics

Sensors; Actuators; Digital and analog computer interfacing; SCADA (supervisory control and data acquisition); PLS's and controllers.

IND013 - Simulation

Principles of discrete simulation of stochastic processes; Generation of random numbers and random variables with the Monte-Carlo principle; Concept models; Theory techniques and Auxiliaries for the analysis of input and output of simulation models; Applications with a software package.

IND015 - Manufacturing Systems

Introduction to manufacturing systems; CAD systems and geometric modeling; Concurrent engineering; Process planning and group technology; Computer control of manufacturing systems; Robots; Flexible manufacturing; CIM.

IND016 - Engineering Management

Aspects of management practice including planning, organizing, staffing and training; Leadership and control; Management of matrix organizations consisting of line and project functions and speciality staff; Project management and engineering and new product development techniques; Industrial psychology; Motivation, leadership creativity and entrepreneurial behavior; Social responsibility and ethics.

IND017 - Engineering Economics

Introduction to accounting; Balance sheet; Profit and loss account; Cash flow statements; Ratio analysis and interpretation of financial statements; Manufacturing cost analysis; Time value of money; Discounting techniques; Economic analysis of investment proposals; Taxation influence after tax analysis.

IND018 - Reliability Engineering

Introduction; Failure distribution; Constant failure rate model; Time-dependent failure models; Reliability of systems; State-dependent systems; Physical reliability models; Design for reliability; Maintainability; Design for maintainability; Availability; Data collection and empirical methods; Reliability testing; Reliability growth testing; Identifying failure and repair distributions; Goodness-of-the-fit tests; Reliability estimation and applications; Implementation.

IND019 - Combustion Engineering

Scope and history; Fuels; Thermodynamics of combustion; Chemical kinetics of combustion; Flames; Gas fired furnace combustion; Detonation of gaseous mixtures; Spray formation and droplet behavior; Gas turbine spray combustion; Direct injection engine gaseous mixture; Solid fuel combustion mechanics; Fixed bed combustion; Suspension burning; Fluidized bed combustion.

IND020 - Engineering Tribology

Tribology versus tero-technology; Friction; Wear; Lubrication; Behavior of tribological components; Other tribological measures; Tribo-technical systems; Tribological monitoring of equipment's condition; Tribology in metal working processes; Tribology in steel industries; Tribology in mining industries; Tribology in paper and pulp industries; Tribology in glass fiber industry; Tribology in transport sector.
