



The University of the West Indies

St. Augustine, Trinidad and Tobago, West Indies

FACULTY OF ENGINEERING

THE DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

ECNG Math Support Programme: Level 1 Readiness

Aim

The aim of the Mathematics Level 1 Support Programme offered by the Department of Electrical and Computer Engineering is to equip its participants with the tools necessary to undertake level 1 study in the Department's BSc degree programme by solidifying their mathematical foundation before study and providing strategic support during their course of study.

Participants

The Mathematics Support programme is targeted at students and technical staff in the Department.

Entrance Level Expectations

Familiarity with the following pre-requisite material is expected for the Level 1 Readiness Programme: CAPE Pure & Applied Mathematics or GCE Advanced Level Mathematics. Core topics in pre-requisite material will be revised as necessary.

Method of Delivery

The programme is delivered via two self-contained sessions per week; a 1-hour session and a 2-hour session. Sessions are focussed towards the participants' understanding of subject matter via practice with in-session questions. A typical session comprises a target question, a lesson and in-session questions. Sessions may also be tailored to revision and appreciation of fundamental concepts, as necessary. Participants may choose to attend selected sessions as necessary.

Sessions have directed learning as their focus. Participants are apprised of the objective/s of each session in advance and are expected to relate all activities for the session to the objective/s. Post-session support is also provided in the form of revision questions and solutions. Tutors are available for consultation outside of session hours.

Session Format

1) Target Question(s)

- **The target question epitomises the session objective.** It represents a working example of the kind of question that participants should be able to answer at the end of the session. Participants should expect to be well equipped to handle questions of difficulty that are comparable to the target question.
- **Questions may be derived from courses.** They may derive from any course within the Faculty of Engineering. The question may be used in its entirety but the mathematical starting point is always clearly identified.
- **Questions may be a direct mathematics problem.** They may be taken from resources that do not relate to courses within the Faculty of Engineering. These may include Math textbooks, e-books and other online question repositories. The level of difficulty of the target question is not significantly greater than that of the participant's target entry level.

- **Questions may incorporate multiple topics and skills.** These questions require participants to draw upon previously taught knowledge to solve target question. Online resources will be provided in advance for support.

2) Lesson

- **The Lesson is taught based on target question.** Participants are equipped with the necessary tools required to solve the target question. The various aspects of the target question are disseminated and treated with. Each aspect is then brought together to provide a complete solution to the target question.
- **Lessons are supported by online resources.** Participants will be supplied with resources which include the fundamental principles of the topic being delivered as well as derivations and revision questions and solutions. Resources are posted online before each session.
- **Lessons explore alternative methods of solving target question, where possible.** Participants are encouraged to explore all relevant methods of solving the target question when multiple methods exist. Pre-requisite resource-support for alternative methods will be made available prior to session.

3) In-Session Questions

- **Questions vary in difficulty level.** In-session questions cater for participants at various levels of expertise in the session objective. Question difficulty ranges from easy to difficult and the number of in-session questions does not exceed 10 per session. The maximum difficulty of in-session questions is not significantly greater than that of the target question.
- **Questions are corrected in session.** In-session questions are corrected to ensure that participants understood what was taught and that session objective is achieved. Participants are encouraged to ask questions during the correction exercise.

Syllabus

Solution of Quadratic Equations

- Factorisation – Difference of squares, trinomials, common factors, grouping
- Completing the Square
- Formula
- Graphical Method

Absolute value and Inequalities

- Understand meaning of $|x|$ and solve equations with modulus functions
- Solve Linear Inequalities

Functions and Graphs

- Understand relationship between graph and equation
- Equation of a line, quadratic equation, circle
- Curve Sketching
- Remainder and Factor Theorem
- Partial Fractions

Indices, Surds, Exponents and Logarithms

- Indices and surds
- Rules of Indices
- Rules of Logarithms

Trigonometry

- Sine, Cosine, Tangent and Inverse Functions

- Degrees and Radians
- Pythagoras' Theorem
- Identities

Vectors and Matrices

- Scalar and Vector Quantities
- Modulus of a vector
- Addition and Subtraction of Vectors and Matrices
- Matrix Multiplication
- Inverse and Singular Matrices

Complex Numbers

- Properties of Complex Numbers
- Complex Number Representations

Differentiation

- Introduction to Limits
- Differentiation as gradient function
- Differentiation of polynomial, trigonometric & logarithmic functions
- Maxima and Minima

Integration

- Integration as area under a curve
- Integration as reverse process of differentiation
- Integration of polynomial, trigonometric & logarithmic functions
- Definite Integral (with limits) and Indefinite Integrals
- Integration by parts and using substitution rule

Differential Equations

- Separation of Variables
- Integrating Factor Method
- 2nd Order Differential Equations (Homogeneous, Non-Homogeneous)

Schedule

Start date: 27th January 2009

End date: 23rd April 2009

Times and Venue:

- **Tuesday** 12:00-1:00 pm. **Venue:** CSA, 2nd Floor, Department of Civil Engineering, Block 2
- **Thursday** 12:00-2:00 pm. **Venue:** CSA, 2nd Floor, Department of Civil Engineering, Block 2

Contact Details:

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- Jevon Beckles: EXT 3758, Jevon.Beckles@sta.uwi.edu

Website:

- **Link:** <http://myelearning.sta.uwi.edu/login/index.php>
- **Course:** ECNG: Maths Resource Centre
- **Username:** ecngmrc
- **Password:** everupward

Delivery Schedule by Topic

Wk	Tutor	Day	Topic	Topic Detail
1	Jevon	Tues 27 th Jan	Algebra	<ul style="list-style-type: none"> • Solution of quadratic equations • Inequalities • Absolute value
	Tariq	Thurs 29 th Jan	Algebra	<ul style="list-style-type: none"> • Functions • Graphical representation of functions • Intro to exponents
2	Jevon	Tues 3 rd Feb	Algebra	<ul style="list-style-type: none"> • Exponents • Indices and logs • Radicals and Surds
	Tariq	Thurs 5 th Feb	Algebra	<ul style="list-style-type: none"> • Simultaneous equations • Graphical solution of simultaneous equations
3	Jevon	Tues 10 th Feb	Trigonometry	<ul style="list-style-type: none"> • Intro to sine, cosine & tangent (with graphs) • Pythagoras Theorem • Intro to Trigonometric identities
	Tariq	Thurs 12 th Feb	Trigonometry	<ul style="list-style-type: none"> • Trigonometric identities • Concept of Radians • Inverse Trigonometric functions • Range of Trigonometric functions
4	Tariq	Tues 17 th Feb	Vectors	<ul style="list-style-type: none"> • Intro to vectors • Reflection of past topics with formative assessments.
	Jevon	Thurs 19 th Feb	Matrices	<ul style="list-style-type: none"> • Intro to matrices • Solving simultaneous equations with matrices
5	Tariq	Tues 24 th Feb	Complex Numbers	<ul style="list-style-type: none"> • Basics in Complex Numbers
	Jevon	Thurs 26 th Feb	Calculus	<ul style="list-style-type: none"> • Intro to limits • Intro to Differentiation • Differentiation of polynomials
6	Tariq	Tues 3 rd Mar	Calculus	<ul style="list-style-type: none"> • Differentiation of logs and Trigs • Differentiation of Trigonometric Identities • Maxima and minima
	Jevon	Thurs 5 th Mar	Calculus	<ul style="list-style-type: none"> • Intro to Integration • Integration of Trigs and Logs • Definite and indefinite integrals
7	Tariq	Tues 10 th Mar	Calculus	<ul style="list-style-type: none"> • Integration using Substitution Rule
	Jevon	Thurs 12 th Mar	Calculus	<ul style="list-style-type: none"> • Integration by parts
8	Tariq	Tues 17 th Mar	Algebra	<ul style="list-style-type: none"> • Partial fractions • Remainder and Factor Theorem
	Jevon	Thurs 19 th Mar	Algebra & Calculus	<ul style="list-style-type: none"> • Using Partial Fractions in Integration
9	Tariq	Tues 24 th Mar	Differential Equations (DE)	<ul style="list-style-type: none"> • Introduction to the Solution of DE • Separation of Variable
	Jevon	Thurs 26 th Mar	DE	<ul style="list-style-type: none"> • Intro to Second order DE
10	Tariq	Tues 31 st Mar	DE	<ul style="list-style-type: none"> • Non-homogeneous DE • Undetermined coefficients
	Jevon	Thurs 2 nd Apr	DE	<ul style="list-style-type: none"> • Revision of DE
11	Tariq	Tues 7 th Apr	Functions	<ul style="list-style-type: none"> • Curve sketching
	Jevon	Thurs 9 th Apr	Functions	<ul style="list-style-type: none"> • Revision of Curve sketching
12	Tariq	Tues 14 th Apr	Revision	<ul style="list-style-type: none"> • Interactive Session on any topic
	Jevon	Thurs 16 th Apr	Revision	<ul style="list-style-type: none"> • Interactive Session on any topic
13	Tariq	Tues 21 st Apr	Revision	<ul style="list-style-type: none"> • Interactive Session on any topic
	Jevon	Thurs 23 rd Apr	Revision	<ul style="list-style-type: none"> • Interactive Session on any topic