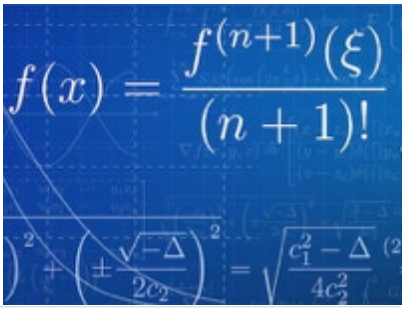
COURSE OUTLINE

PURE MATHEMATICS, CAPE UNIT 2

Complex Numbers, Analysis & Matrices



Instructor	: G. David Boswell
Institution	: Hampton School, Jamaica
Department	: Mathematics
Timeframe	: Academic Year 2022 - 2023
Audience	: Advanced Level Students preparing for Colleges and Universities

1. PREAMBLE: General Goals, Intellectual Merits and Broader Impacts

The art of mathematics is among our universal means of creating, communicating, connecting and applying structural and quantitative ideas. It is used in the abstract modeling, approximations, and solutions to challenge problems of *space, change and time*. As such, this course aims to develop students with increased competencies in a myriad of logic, inductive and deductive reasoning and advanced computational methods and tools.

In particular, this course will push the *utility of mathematics* beyond its value as a computational tool to deeper insights of underlying axioms, theorems, laws, concepts and proofs. It is therefore expected that not only will students be equipped with more advanced ideas, skills and mathematical techniques, but also they will also gainfully be encouraged to appreciate (a) the concepts involved and the 'giants' before us, (b) data modeling and greater problem understanding, and (c) the "why's & how's" of disciplined and correct solution techniques.

Specifically, the students will be exposed to advanced topics such as *Complex Numbers, Calculus, Infinite Series, Matrices and Differential Equations;* used to highlight how mathematical concepts form the basis of practical generalizations. This will be shown to be of significant merits and application scopes that addresses multidisciplinary issues. The broader impacts envisioned is that students select future career options such as Engineering, Computing and Software Development, Medicine, Economics, Finance, etc. Overall, its is the aim to help develop human capacity for the next generation workforce of the nation.

2. PREREQUISITES

- *Pure Mathematics, Unit 1* ~ The prerequisite knowledge base for this unit has its foundations in (i) Number Theory, (ii) Set Theory, (iii) Algebra, (iv) Geometry and (v) Trigonometry. Much of these topics are dealt with at the CSEC level or any other equivalent proficiency. But is it the foundation work done in Pure Mathematics (Unit 1) that is essentially required for the transition to Unit 2.

3. CONTENTS

The broad areas and topics of this 3-module course that will be addressed this year are:

Module 1: COMPLEX NUMBERS AND CALCULUS II

(a) Complex Numbers

(b) Differentiation II

(c) Integration II

Module 2: SEQUENCES, SERIES AND APPROXIMATIONS

(a) Sequences

(b) Series

(c) Binomial Theorem

(d) Roots of Equations

Module 3: COUNTING, MATRICES AND DIFFERENTIAL EQUATIONS

(a) Principles of Counting and Probability with a detailed review of Set Theory

(b) Matrices and Systems of Linear Equations

(c) First and Second Order Differential Equations and Modeling

4. TEXTBOOKS

Prescribed

- Dipchand Bahall (2013). *Pure Mathematics (Unit 2) for CAPE Examinations*. Macmillan Caribbean
- Pure Mathematics for CAPE, Unit 2 - A *Caribbean Examinations Council (CXC)* Study Guide. Oxford University Press

Reference

- Bostock, L. and Chandler, S. (2000). *Core Maths for Advanced Level*. (3rd Edition). London: Stanley Thornes Limited

5. COURSE DELIVERY

Several blended modalities of live, virtual and face-to-face content delivery methods have been developed. These are ongoing and include, but not limited to, deployment of the following:

- ***Keynote Tutorials*** using
  - the dynamic Web Portals for this class which now features *Keynote Live* on its platforms, and
  - *Zoom Cloud Conferencing* with limited pre/post class video recordings;
- ***Guided Worksheets*** with online support using Web-based computational tools powered by MATLAB™ and Mathematica™ computational engines;
- the instructor's ***Legacy Runtime Revision Sessions*** (R2S™) for MSE students;
- ***iDoceo Connect*** for online students' testings and submissions that features, in particular, instant feedback of randomized MCQ tests results.

6. CLASS SCHEDULE *

The teaching schedule for this course, which also involves completing Internal Assessment (IA) requirements, is as follows:

Weekdays	Time Intervals
Monday	08:15 - 09:45
Wednesday	13:00 - 14:30
Friday	10:15 - 11:45

* Beyond this schedule, support using the R2S™ Online *Help Desk Forms* (or any other communication technologies) are available for enrolled students to utilize.

7. ASSESSMENT MODES

At minimum, this will include:

- Weekly assignments and/or biweekly quizzes featuring online testing and feedback with detailed study solutions;
- Trial Runs (mock examinations) — one for each of the three Internal Assessment (IA) module tests;
- 3 Final Internal Assessment (IA) tests consistent with the guidelines of the CXC syllabus.

8. CONTACT INFO - Online Resources and Communications

All students of the class will be provided with the instructor's addresses, working sites and access codes for the following routinely used communication protocols:

- Runtime-Revision Sessions (R2S™) class-specific sites that house all resources including legacy Keynotes and Cloud Computing Widgets;
- R2S™Upload Portal (FTP database) for students to post reports, etc.
- Zoom ID and access codes;
- iDoceo Connect and codes for real-time online testing and feedback;
- Standard eMail, G-Suite access and WhatsApp.

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