THE COUNCIL OF COMMUNITY COLLEGES OF JAMAICA

CURRICULUM GUIDE



Associate of Applied Science

in

Architectural and Construction Technology

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The Council of Community Colleges of Jamaica (CCCJ) is a statutory agency under the Ministry of Education, formed by an Act of Parliament, which was passed in December 2001, to supervise and coordinate the work of Community Colleges in Jamaica. The Council, which comprises members of the Colleges, representatives from other sectors of the tertiary and secondary education system, as well as members of business and industry, held its first meeting in July 2002 and established business Offices at 24 Trafalgar Road in August of the same year.

At the present time, there are eight affiliate colleges, five of them being Community Colleges and the other three being multi-disciplinary colleges. The colleges offer programmes from the certificate, diploma, associate, and baccalaureate levels as well as a number of continuing education courses. Additionally, the colleges offer professional programmes, franchise programmes, and pre-university courses incollaboration with the University of the West Indies, the University of Technology, and other universities/colleges.

In the pursuance of the twin objectives to supervise and coordinate the work of the Colleges, the CCCJ is mandated to exercise essentially three main functions.

1. **Regulatory Function**

   The CCCJ, through its regulatory function, seeks to determine and implement common standards in the Colleges to ensure the integrity of the courses from one campus to the next, and also with the intention of addressing the need for articulation with other educational institutions both locally and abroad. In this regard, the CCCJ:

   a. Prescribes the conditions under which individuals may be admitted as students of community colleges.
   b. Considers, recommends, and approves curricula to be used in the affiliate colleges
   c. Determines conditions for the holding of examinations.
   d. Examines and assesses the work of students in the colleges.

2. **Promotional Function**

   The CCCJ's promotional role covers:

   a. Advising the Minister of Education on policy and education matters relating to community colleges.
   b. Promoting the interests of community colleges.
   c. Implementing public awareness programmes relating to community colleges.

3. **Developmental Function**

   The CCCJ's developmental function relates to:

   a. Providing professional development opportunities for members of staff of the colleges.
   b. Collaborating with other institutions, including institutions of further and higher learning, in the provision of educational opportunities.
   c. Soliciting and receiving grants, donations, prizes, or gifts on behalf of community colleges, subject to the approval of the minister of education.

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Programme Background

Construction is the process through which the entire built environment is created and shaped, including critical physical infrastructure, shelter, and urban spaces, and has a significant impact on the natural environment. The Construction sector also draws on a wide range of inputs, including building materials and supplies, labour and professional services, energy, transport, and other supplies. (*Construction Sector Plan 2009-2030, PIOJ*). Construction is an essential component in the industrialization and sustainable development of nations and has played a fundamental role in the Jamaican economy for centuries. On average, the sector accounted for 7% of the country's GDP (*PIOJ, 2012-2016*).

The construction sector has many links with other domestic economy sectors, including housing, manufacturing, tourism, transport, financial and business services, communication, and distribution. Consequently, any economic activity in these sectors contributes to growth in the construction sector through their construction cost component. The sector also benefits from cyclical trends, for example, the stimulus provided by the need to rebuild after the impact of natural disasters which tend to stunt economic growth in other sectors.

Both residential and non-residential constructions are projected for growth in the Jamaican economy. Several infrastructural projects by the Government of Jamaica in roads, highways, housing, new cities, and others by the private companies (China Harbour Engineering Company, Grace Kennedy, etc.), especially to meet the emerging demand from the Business Process sector, are fueling growth in the construction sector. This increased demand requires professionals who are competent and certified to deliver carpentry, mason, electrical and supervisory skills to the construction and building sector.

The courses in the Architectural and Construction Technology Applied Associate Degree programme train students in the essential skills necessary for effective management and leadership on a construction site. These skills range from construction practices to safety to general business subjects.

Common course topics include the following:

- Introductory Construction Safety and Health Regulations
- Building Services
- Use of CAD Applications
- Land Surveying
- Advanced Architectural Drafting
- Introduction to Management
- Major Project

The new National Building Code and other relevant legislations require that international and regional standards are utilized in the construction and building sectors, especially in Jamaica, where natural disasters make buildings vulnerable to serious damages. The need for trained and certified building and construction professionals who are competent and ready to apply these standards requires training institutions such as the community colleges to provide these graduates for the sector.

In addition, the focus on Green Construction, and Smart Building technologies that address issues relating to sustainability and efficiency, are critical components in modern building and construction studies. The *Construction Sector Study 2018*, done by the HEART Trust/NTA on its Labour Market Information Portal (*LMIP*), highlighted several emerging trends in the construction and building sector that are important aspects in this curriculum.

Programme Rationale

The Construction Sector represents a critical component of any country based on its impact on national development. The sector currently suffers from a shortage of skilled construction workers; this has affected a number of major projects in recent years and has consequently led to an importation of skilled workers (e.g., from the Dominican Republic, China, and other countries) to fill the existing gaps) and so this programme seeks to provide certification for locals involved in the sector.

Labour market information (*Construction Industry Study, 2018*) provided by *HEART Trust NTA* projected an increase in the demand for construction workers through the Tourism sector. The Ministry of Tourism and Entertainment predicts that by this current year (2016), an additional 2,694 hotel rooms would be added to the sector. This addition will result in the increase of employment within the construction industry from the development of these rooms. It also states that 2017 would see a projection of 8,800 rooms added, which would further contribute to the growth within the construction sector.

The investment consequences within the Tourism sector will result in affordable housing solutions being constructed for tourism workers. Construction has been listed as one of the sectors that will be in high demand with the projected growth and development of the Tourism sector. Statistical data provided by *Vision 2030 Construction Plan* reflects that the construction sector will experience growth of approximately 4.24% by 2030. The sector is also due to see an increase in the construction of infrastructure such as bypasses, highways, schools, etc.

One of the most outstanding strengths of the Construction Industry is the constant availability of labour supply for the labour market. As of October 2017, the Construction Industry in Jamaica employed a total of 103,100 individuals making it the third largest employing industry in the Country. Employment increased by 8,800 persons or 9.3% relative to the previous quarter (July 2017), which recorded a total of 94,300 employed individuals.

Construction jobs that will be in demand are **Carpentry, Artistic Mason, Cement Batching, Construction Finisher, Moulding Specialist, Specialist Marble Installer, Construction Foreman/Supervisor, and Tile finisher**.

The increased demand for trained and certified workers is the reason for this programme. Based on labour demand projections by the *US Bureau of Labour Statistics*, employment of construction and extraction occupations is projected to grow 11 per cent from 2016 to 2026, faster than the average for all occupations, a gain of about 747,600 new jobs. Overall growth in the economy and population will increase demand for new buildings, roads, and other structures, which will create new jobs in construction and extraction occupations. (https://www.bls.gov/ooh/construction-and-extraction/home.htm)

Programme Description

The Architectural and Construction Technology programme is a two-year Applied Associate Degree with a total of 75 credits that seeks to provide individuals with theoretical, technical, and vocational knowledge and skills that will lead to employment and further studies in the field of the built environment.

The courses will enable the graduate to work in related areas or continue toward a Bachelor's degree in an associated field of technology such as Construction Management, Architecture, Quantity Surveying, Land Surveying, etc. The Building Technician graduating with a CCCJ's Applied Associate of Science Degree in Architectural and Construction Technology will be able to undertake work requiring a knowledge of drafting, construction materials, mechanical and structural systems, estimating, site and building design fundamentals and presentation methods, building codes and specifications, and computer applications.

In the second year of the programme, a culminating course is provided over two semesters to cement the various principles, competencies, technologies, and knowledge gained in the course. This Major Project/Capstone course will help the learner to develop a wholistic appreciation and application of the programme to their chosen career area in the building and construction sector.

Programme Goals

A graduate of this programme should be able to:

1. Implement solutions to practical problems in the built environment as an individual and in teams.
2. Use appropriate tools, media, computers, networks, and applications software to produce built environment solutions.
3. Understand and integrate in projects the various applications of construction materials, systems, and methods used in the building industry.
4. Perform mathematical computations to assist in the solution of built environment problems.
5. Demonstrate an understanding of the relationship between architecture to other construction fields.
6. Demonstrate a basic knowledge of the design process and an appreciation for the beauty of architecture as visual art as applied in the built environment.
7. Explain the development stages of a typical building project.
8. Work cooperatively in teams.
9. Use various media, including manual drafting and computer-aided drafting, to create complete and effective two and three-dimensional architectural documents and models.
10. Understand architectural drawings and related documents.
11. Appreciate the responsibilities of those involved in the built environment profession
12. Understand the impact of construction choices on the global economy and built environment.

Graduates should be able to matriculate into a Bachelor's Degree in Construction Services that is offered by institutions across the Caribbean and the Americas. Although in some institutions, the Applied Associate degree graduate may be required to do additional credits where weak academic passes are obtained or where a programme does not develop competence in a required entry level skill.

Matriculation Requirements

To matriculate to the programme applicants must fulfil one of the following:

1. Pass five (5) subjects in GCE 'O' Level, including English and Mathematics, a related technical subject (Technical Drawing, Building Technology, Mechanical Engineering Technology, Electrical and Electronic Technology and Visual Arts) or Science subject (Physics, Chemistry, or Integrated Science) and any other two appropriate subjects, with grades A, B or C.

2. Pass five (5) subjects in CXC, including English, Mathematics, and a related technical subject (Technical Drawing, Building Technology, Mechanical Engineering Technology, Electrical and Electronic Technology, and Visual Arts) or Science subject (Physics, Chemistry, or Integrated Science) along with two (2) other subjects, with grades I, II or III. Grade III pass must be after September 1998.

3. Mature Student Entry. Applicants falling in this category must be over the age of twenty-five (25), with a minimum of five (5) years of experience in a specialized area of the industry, for e.g., Mechanical Engineering, Woodwork, Construction, Electrical Engineering. Applicants will be accepted based on his/her employment portfolio, as well as certificates of achievement and positions held along with job description and community involvement. Each applicant will be assessed independently of the other. Refer to the Prior Learning Manual for additional information.

4. City and Guilds

Effective 2020 September, CCCJ will accept Stage 3 City and Guilds Mathematics and English as qualification for matriculation. Students will, however, be required to complete bridging courses, Foundation Concepts in Mathematics II and III, for heavily Mathematics-based programmes.

The CCCJ acknowledges the following examining bodies.

1. **The Caribbean Examination Council - CXC**

   A **pass** in a subject offered by The Caribbean Examination Council at the CSEC level is defined as follows:

   Grades: I and II - up to January 1998
   Grades: I, II, and III - as of May 1998

2. **University of Cambridge - GCE O' Level**

   A **pass** in a subject offered by The University of Cambridge at the GCE O' Level is as follows:

   Grades: A, B, C

3. **Secondary School Certificate- SSC**

   A **pass** in a subject offered by the Ministry of Education at the SSC level is as follows:

   Ranges: IV or V

Note:

In the event of adjustments to the grade schemes by the respective examining bodies, the new grade schemes are deemed applicable with or without any further action on the part of the CCCJ.

For the Associate Level, applicants must meet both the **Basic Matriculation Requirements** as well as the **Programme Matriculation Requirements**.

The Basic Matriculation Requirements generally specify a minimum of **five (5)** passes in subjects at CSEC, GCE 'O' Level, or SSC including English 'A' or English Language and Mathematics and are applicable to all programmes offered by the CCCJ.

The Programme Matriculation Requirements are specific to the particular programme of study being considered by an applicant. As such, each applicant **MUST** consult the **Programme Matriculation Requirements section of this curriculum handbook to determine what Programme Entry Requirements might be required for the particular programme.**

(Basic Matriculation Requirements + Programme Matriculation Requirements)

Therefore:

An applicant seeking entry to the Associate of Applied Science Degree in Architectural and Construction Technology programme must possess:

1. Five (5) CSEC subjects including English 'A' and Mathematics (Basic Matriculation Requirements).
2. One of the five (5) passes must be in Mathematics (Programme Matriculation Requirements).

Basic Matriculation Requirements

There are **two (2)** methods by which an applicant can meet the Basic Matriculation Requirements; these are classified as Standard forms of matriculation and Alternate forms of matriculation.

1. Standard forms of matriculation

An applicant **MUST** have a minimum of **five (5)** passes in subjects at CSEC or GCE O' Level, **including** English 'A' (CSEC) **or** English Language (GCE O' Level) and CSEC Mathematics.

2. Alternate forms of matriculation

a. Equivalent qualification(s) as determined by the CCCJ.
b. Mature Status as determined by the CCCJ.
c. Level 3 HEART NVQJ Certification as determined by the CCCJ.

3. Mature Student Entry

Applicants falling in this category must be over the age of twenty-five (25), with a minimum of five (5) years of experience in a specialized area of the industry, for e.g., mechanical engineering, woodwork, construction, electrical engineering. Applicants will be accepted based on his/her employment portfolio, as well as certificates of achievement, positions held along with job descriptions and community involvement. Each applicant will be assessed independently of the other. Refer to the Prior Learning Manual for additional information.

Target Group

This programme targets any of the following individuals:

- Persons with industry experience seeking certification.
- Persons with industry experience who need formal training.
- Persons who want to change their career path.
- High school graduates interested in careers in the Architectural and Construction Technology industry.

Programme Duration

The programme may be offered as follows:

Schedule	Duration	Days Offered
Full-time	Four (4) semesters (2 years)	Weekdays, evenings, and weekends.
Part-time	Six (6) summers) semesters (3 years or 2 semesters)	Flexibility is applied based on preference of the target group.

The CCCJ offers programmes at the Associate and Bachelor's levels using a 2 + 2 concept. Under this 2 + 2 concept, the first two (2) years of the programme are at the Associate level, and the final two (2) years are at the Bachelor's level:

The programmes are structured to provide a mixture of:

1. General education courses
2. Support courses
3. Specialized courses
4. One free elective
5. Work experience

Programme Review Alignment Summary

Section/ Course Module	Adjustment
Advanced Construction Technology	Unit I – Adjustment was made to Objective IX. Unit II – Objective I was restated, and in Objective III, the wording changed to 'assess'. Unit III – The hours have been adjusted, Objective I removed and restated, Objective VII and IV restated, and Content I was adjusted. Unit V – The hours have been adjusted, and areas of Objective V have been adjusted. Unit VI – The hours have been adjusted, Objective I adjusted, and Objective II revised and adjusted. Unit VII – The hours have been adjusted. Unit VIII – The hours have been adjusted, Objective I revised, and Content VIII was removed because the objective was removed.
Architectural Drafting I	Unit II outcomes updated. Unit IV was removed. Assessment updated to Coursework 40%, Presentation 20%, Major Project 40%.
Building Science	Units I-II and IV-VI updated. In Unit VI, Objective IX, the structure of the sentence was edited.
Building Services	Assessment changed to 40% Final Examination, 30% Common Coursework, and 30% Test. The unit hours were adjusted to 45 hours.
Capstone Major Project - Construction	Course added to programme. Consultation in semester III and Final Project in Semester IV. Grammatical corrections were made to the course outline.
Construction Technology I	The hours were adjusted in Units II, IV, VI, and VIII as several practical components exist.
General Technology	For Units I & II, the Content changed the word "types" to "categories".

Introduction to (Auto) CAD	The following changes were made: Coursework/Projects – 70% Geometry (Shapes & Isometric Drawing) – 20% Architectural (Floor Plans, Site Plans, and Elevations) – 30% 3D Drawing – 20% Coursework 2 Major Project – 30%
Land Surveying I	Unit II - Objectives 17-22 were removed. Unit I – Objectives 20 and 23 were removed. Unit II – Objectives 9 and 10 adjusted a word, and Objective 14 was removed. Unit III – Objective IV adjusted a word, and Objective VII had a sentence adjusted. Unit V – Objectives II, IX, and XII were removed.
Land Surveying II	Assessment updated. Final examination removed. Individual Project 20%, In-class work 25%, Test 15 %, and Major Project 40%. Course code adjusted to BLDG2303.
Measurements and Estimating	Course outcomes no. 4 and 5 were added. Units I-VI updated. Hours were adjusted to get 45 hours. No objective or content adjustments were necessary.
Physics I	Updated to 4 credits (3 theory, 1 practical) from 3 credits (2 theory,1 practical). All units updated. Assessment changed to 50/50, and texts were updated.
Structures	Credit hours changed from 45 hours theory to 30 hours theory & 45 hours practical. Course description updated. All units updated. Assessment changed from Coursework 40%, Final Examination 60% to 50% for each. Unit IV: Sentence adjustment to Objective IV. Assessment method was reviewed and adjusted to 60% course work and 40% Final Examination. 60% Coursework: 20% Midsemester Test

	20% Common Coursework 20% Laboratory 40% Exam: Final Examination
Technical Drawing I	Updated from 3 theory credits to 1 theory/1 practical credits. Course description updated. Units updated. No MCQs in Exam. Methods of assessment and Evaluation now reads: **1.** Coursework/class participation 20% **2.** Major Project Individual (Unit 2-4) 40% **3.** Major Project Group (Unit 5) 40% The pre-requisite for technical drawing was removed. Unit I-V Continuous Assessment.
Technical Mathematics I & II	Assessment: 40% CW, 20% Test and 40% Final Examination.
General Courses	Introduction to Psychology replaces Introduction to Psychology I. Fundamentals of IT updated.
Infusion of ICT in courses	Links to EbscoHost, ProQuest databases, and Springer USA e-books included in all course outlines.
Specialized Courses	Advanced Architectural Drafting, Advanced Construction Technology I and General Technology were revised/updated, as well as all recommended texts aligned to each course and updated with the most recent text.

Programme Structure

Courses	Course Codes	Credit Hours	Theory Hours	Practical Hours	Corequisites/ Pre-requisites
Advanced Architectural Drafting	ARCH2303	3	45	-	Architectural Drafting I
Advanced Construction Technology	CONS2302	3	30	45	Construction Technology I
Architectural Drafting I	ARCH1201	3	45	-	None
AutoCAD Applications	ACAD2301	3	30	45	Introduction to CAD
Building Science	BLDG1201	3	45	-	None
Building Services	BLDG2302	3	45	-	None
Capstone Major Project Construction	CMPC2401	2	15	45	Completion of all core courses for ADACT
Communication I	COMM1101	3	45	-	None
Communication II	COMM1202	3	45	-	Communication I

Construction Technology I	CONS1201	3	30	45	None
Fundamentals of Information Technology	ITEC1104	3	30	45	None
General Technology	GTEC1101	3	30	45	None
History of Architecture	ARCH2302	3	45		None
Introduction to CAD	ACAD1201	2		90	None
Introduction to Management	MGMT1101	3	45	-	None
Introduction to Psychology	PSYC1110	3	45	-	None
Land Surveying I	BLDG1203	2	45	45	None
Land Surveying II	BLDG2303	2	45	45	Land Surveying I
Measurements and Estimating	BLDG2402	3	45	-	None
Physics I	PHYS1101	4	45	45	None
Structures	CONS2401	3	30	45	Technical Maths II Building Science

Technical Drawing	DRAW1101	2	60	-	None
Technical Mathematics I	MATH1104	3	45	-	None
Technical Mathematics II	MATH1204	3	45	-	Technical Math I
Work Experience/ Practicum/Internship	WOEP1100	3		240 hours minimum	All Semester I and II courses

A.A.Sc. in Architectural and Construction Technology (FULL TIME)

Semester I **YEAR 1**

CODE	COURSE	CREDITS (HOURS)
COMM1101	Communication I	3(45)
MATH1104	Technical Mathematics I	3(45)
ITEC1104	Fundamentals of Information Technology	3(75)
DRAW1101	Technical Drawing	2(60)
GTEC1101	General Technology	3(75)
PHYS1101	Physics I	4(90)
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Semester II

CODE	COURSE	CREDITS (HOURS)
COMM1202	Communication II	3(45)
MATH1204	Technical Mathematics II	3(45)
ACAD1201	Introduction to CAD	2(90)
CONS1201	Construction Technology I	3(75)
BLDG1203	Land Surveying I	2(90)
ARCH2302	History of Architecture	3(45)
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Semester III **YEAR 2**

CODE	COURSE	CREDITS (HOURS)
BLDG1201	Building Science	3(45)
CONS2302	Advanced Construction Technology	3(75)
BLDG2303	Land Surveying II	2(90)
MGMT1101	Introduction to Management	3(45)
ACAD2301	AutoCAD Application	3(75)
ARCH1201	Architectural Drafting I	3(45)
CMPC2401	Capstone Major Project Construct. – Consultation	1(15)
		18

Semester IV

CODE	COURSE	CREDITS (HOURS)
CONS2401	Structures	3(75)
BLDG2402	Measurements and Estimating	3(45)
	Elective	3 (45)
ARCH2303	Advanced Architectural Drafting	3(45)
WOEP 1100	Work Experience	3(240)
BLDG2302	Building Services	3(45)
PSYC1110	Introduction to Psychology	3(45)
CMPC2401	Capstone Major Project Construction– Practical	1(45)
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A.A.Sc in Architectural and Construction Technology (PART-TIME)

Semester I **YEAR 1**

CODE	COURSE	CREDITS (HOURS)
COMM1101	Communication I	3(45)
ITEC1104	Fundamentals of Information Technology	3(75)
DRAW1101	Technical Drawing	2(60)
GTEC1101	General Technology	3(75)
PHYS101	Physics I	4(90)
		15

Semester II

CODE	COURSE	CREDITS (HOURS)
COMM1202	Communication II	3(45)
MATH1104	Technical Mathematics I	3(45)
ACAD1201	Introduction to CAD	2(90)
ARCH2302	History of Architecture	3(45)
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Summer I

CODE	COURSE	CREDITS (HOURS)
CONS1201	Construction Technology I	3(75)
MATH1204	Technical Mathematics II	3(45)
BLDG1203	Land Surveying I	2(90)
ARCH1201	Architectural Drafting I	3(45)
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YEAR 2

Semester III

CODE	COURSE	CREDITS (HOURS)
BLDG1201	Building Science	3(45)
CONS2302	Advanced Construction Technology	3(60)
BLDG2303	Land Surveying II	2(90)
ARCH2303	Advanced Architectural Drafting	3(45)
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Semester IV

CODE	COURSE	CREDITS (HOURS)
ACAD2301	AutoCAD Application	3(75)
CONS2401	Structures	3(75)
BLDG2302	Building Services	3(45)
PSYC1110	Introduction to Psychology	3(45)
CMPC2401	Capstone Major Project Construct.–Consultation	1(15)
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Summer II

CODE	COURSE	CREDITS (HOURS)
WOEP1100	Work Experience	3(240)
MGMT 1101	Introduction to Management	3(45)
	Elective	3
BLDG2402	Measurements and Estimating	3(45)
CMPC2401	Capstone Major Project Construction– Practical	1(45)
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In addition to core content, there are some components that will be infused into the programme to promote the wholistic development of graduates. Infusion of these elements will be done through such strategies as presentations, seminars, and workshops and will not affect the length of the programme.

The programme features the following components: -

- **Foreign Language** — The programme includes a conversational course in Spanish, German, Mandarin, or French. It is intended to introduce learners to the fundamentals of the foreign language (phonics, grammar, syntax, vocabulary, etc.) and culture. The focus of the course is conversational competence. This will equip graduates to communicate competently at this level in a foreign language in current and emerging labour markets.

- **Work Experience/ Practicum/Internship** — Learners are required to complete six (6) weeks (240 hours minimum) of industry attachment/practicum or work experience during the training. The hands-on nature of the teaching and learning process ensures that learners complement their knowledge with practical skills. This will provide an opportunity for them to apply and strengthen the knowledge, skills, and attitudes acquired during their training in the programme.

- **Entrepreneurship**

  The programme aims to continue the development of entrepreneurial competencies of graduates, including their level of creativity and innovation, to enable them to successfully operate a business venture and/or create new products/services, which should ultimately lead to the creation of employment and wealth for self and others. The focus of this component will be:

  - Applying knowledge of financial requirements for operating a small business.
  - Demonstrating knowledge of personnel, production, and operations management.
  - Outlining principles and practices of business law.

- **Employability Skills**

  The programme promotes the development of the following critical employability skills:

  - Communicating clearly, concisely, and correctly in the written, spoken, and visual form that fulfils the purpose and meets the needs of the audience.
  - Responding to written, spoken, or visual messages in a manner that ensures effective communication.
  - Executing mathematical operations accurately.
  - Applying a systematic approach to solve problems.
  - Using a variety of thinking skills to anticipate and solve problems.
  - Locating, selecting, organizing, and documenting information using appropriate technology and information systems.
  - Analyzing, evaluating, and applying relevant information from a variety of sources.

- Showing respect for the diverse opinions, values, belief systems, and contributions of others.
- Interacting with others in groups or teams in ways that contribute to effective working relationships and the achievement of goals.
- Managing the use of time and other resources to complete projects.
- Taking responsibility for one's own actions, decisions, and consequences.

- **STEAM**

The programme is designed to produce graduates of the highest calibre who are not only able to function effectively and efficiently in the workplace but are also able to make significant contributions to the growth and development of their workplaces and the industry. As such, the courses incorporate relevant aspects of Science, Technology, Engineering, Arts, and Mathematics (STEAM) in real-world and problem-based contexts.

This supports the development of graduates who possess critical 21st-century skills that drive innovation.

The core STEAM skills include the following:

- Inquiry
- Communication
- Self-direction
- Problem Solving
- Innovation
- Collaboration

- Critical Thinking and Analysis
- Creativity
- Aesthetic Appreciation

For the A.A.Sc. Degree in Architectural and Construction Technology Programme, the following STEAM areas should be emphasized in the delivery:

- Scientific principles of the built environment.
- The technology involved in using and maintaining tools, machinery, and equipment.
- Performing related mathematical procedures in work.
- Design processes involved in carrying out work.
- Application of communication and collaborative skills in work.
- Troubleshooting and problem-solving in workplace operations.

- **Gender Sensitivity**

The programme is designed to produce graduates who are conscious of the need to avoid gender stereotyping and making gender distinctions that limit the roles of men and women based on sex or gender.

• **Cultural Diversity/Sensitivity**	The programme is designed to produce graduates who are sensitive to the cultural diversity within the wider society. Learners are encouraged to have an appreciation of the need to coexist in an institution with variations in religion, ethnicity, racial and socio-economic situations. Learners should understand how to be tolerant and accommodating to persons of other cultures.
• **Sustainable Environmental Practices**	Learners are required to develop an awareness of environmental issues and their correlation with sustainable development. Sustainability and current environmental practices must beinfused in training and practice. Examples of areas that should be included are: protection of the environment, optimizing the use of resources, and ensuring use of environmentally friendly products and methods of waste disposal.

Delivery and Learning Strategies

The methods of delivery or modes of instruction and learning are expected to deliver/facilitate content appropriate to the subject area and learning styles of students to ensure that course objectives are met. The teaching-learning strategies to be employed will incorporate relevant and current technologies and will also include but are not limited to:

- Interactive lectures
- Simulations
- Demonstrations
- Project-based learning
- Field-based learning
- Case studies and Analysis
- Role plays
- Research
- Observations
- Presentations
- Laboratory exercises
- Self-directed learning
- Problem-solving
- Discussions
- Guided practice
- Guest Lectures

The delivery and learning strategies/modes of instruction are intended to:

1. Increase the independence of the learner.
2. Create critical thinkers.
3. Equip learners to enter the corporate world or start their own business.
4. Assist the learner to:
    a. Develop research skills.
    b. Analyze and evaluate data.
    c. Plan, design and implement projects.

Faculty members or teams will determine for themselves the appropriate teaching/learning strategies for each curriculum unit based on the intended learning outcomes, the needs of their learners and the availability of resources. It is intended that teaching/learning strategies utilized are those which encourage the progressive development of the learners' independent learning skills in all courses.

Evaluation and Assessment Strategies

Evaluation of student learning is aligned with the stated intended learning outcomes for each course. This involves a multi-faceted approach which is used to assess students' critical thinking as well as attitudinal skills. For this reason, evaluation is a blend of practical and theoretical tasks divided into a pre-defined ratio[1] of coursework to end of semester examinations[2]. In some cases, summative assessments will include both a skill assessment and knowledge assessment. The assessment strategies used will include, but are not limited to:

1. **Evaluation**

   a. **Coursework:**

Coursework will be a combination of any of the following:

i. Weekly tests
ii. Laboratory activities
iii. Field-based assessment
iv. Projects (individual or group)
v. Condensed or summary reports
vi. Self and peer evaluations
vii. Performance Tasks
viii. Demonstrations
ix. Portfolios
x. Oral Reports and Presentations
xi. Graphical Displays
xii. Interviews

   b. **Final Examination:**

In an effort to enhance quality, there is a standardized examination for each course, which is common in all colleges. There are typically three (3) examination sessions within an academic year: December, May, and August. The end of semester examination (Final Examination) will be a combination of any of the following**:**

i. Multiple Choice Questions (MCQs)
ii. Structured Questions (SQs)
iii. Practical Assignments (PAs)

[1] The applicable ratio of coursework to end of semester examination is found in the respective course outline
[2] In reference to the end of semester examination (Final Examination), with a duration of two (2) hours.

Grading Scheme

1. Grading

Typically, a student's final grade is calculated by the combination of the course work grade and the final examination grade. The specific course outline can be consulted regarding the applicable grading scheme.

A student who attains a combined grade of:

a. 50% or more is deemed to have passed the course.
b. At least 45% but less than 49% is deemed to have failed the course and qualifyfor a supplemental examination[3].
c. Less than 44% is deemed to have failed the course and will be required to repeat the course in its entirety.

Examination Grades, Points, and Distribution

Effective Academic Year September 2014

Percentage Scale	Grade	Grade Point	Student Performance Description
90-100	A	4.00	**Excellent**
80-89	A-	3.67	
75-79	B+	3.33	**Good**
70-74	B	3.00	
65-69	B-	2.67	
60-64	C+	2.33	**Satisfactory**
55-59	C	2.00	
50-54	C-	1.67	
45-49	D+	1.33	**Marginal Fail – Re-sit**
40-44	D	1.00	**Fail – Redo**
0-39	U	0.00	**Unsatisfactory**

[3] The supplemental examination must be done at the next available sitting within the current academic year. The grade received therein shall be the student's final grade for the course. A student who fails a supplemental examination is required to repeat the course in its entirety.

LEVELS OF AWARDS

BACHELOR OF SCIENCE		**ASSOCIATE OF ARTS** **ASSOCIATE OF SCIENCE**	
G.P.A	Classification	G.P.A	Classification
3.70 - 4.00	First Class Honours	3.70 - 4.00	Honours
3.30 - 3.69	Second Class Honours(Upper)	2.70 - 3.69	Credit
2.70 - 3.29	Second Class Honours(Lower)		
1.70 - 2.69	Pass	1.70 - 2.69	Pass

Graduate Profile

Graduates from the A.A.Sc. in Architecture and Construction Technology programme should be:

1. Technologically competent
2. World-ready workers
3. Self-directed
4. Life-long learners
5. Critical thinkers
6. Problem-solvers
7. Socially and culturally aware
8. Contributors to community and national development
9. Team players
10. Possess excellent communication skills
11. Entrepreneurial
12. Environmentally aware
13. Gender inclusive
14. Ethical and professional

Employment/ Career Opportunities

The technical and interpersonal skills developed by this programme are the basis for an expanding variety of rewarding and challenging careers at the middle management level in an organization. Graduates should be able to function at every entry-level position in careers such as:

Assistant Architectural Designers

Estimators – Construction, Building

Draftsmen

Building Inspectors

Assistant Land Surveyors

Construction Manager Assistant

Building Technician

Building Maintenance Technician

Construction Supervisor

Construction/Building Foreman

Advanced Architectural Drafting (ARCH2303)

The course focuses on communication skills through various exercises in all aspects of drawing composition and graphics, sketch, presentation, working drawings, and drawing of architectural elements and their detailing.

Advanced Construction Technology (CONS2302)

An advanced course, students will cover the following topics: Structural Steelwork frames, Stairs, Piled Foundations, Demolition, Contract Administration, Claddings, Fire Prevention, Sound Insulation, Thermal Insulation, and Builders Plant.

Architectural Drafting, I (ARCH1201)

The course will introduce students to the foundation and basic technical skills of drafting. It will familiarize students with the fundamental principles of Architectural Drafting as it relates to the architectural profession. The first section of the course will cover the basic techniques of fine lettering scale and symbols, followed by single and multi-view drawing details and working drawing.

AutoCAD Applications (ACAD2301)

This advanced course is designed to further develop the student's knowledge of AutoCAD, its application, and its integration with other software such as Microsoft Word.

This will involve programme application and co-ordination of computer systems and networks, withparticular reference to the production of architectural working drawings, storage, schedules, programs, and applications for an architectural project.

Building Science (BLDG1201)

This course is designed to introduce the fundamental aspects of building mechanics and physical science that impact the design and structural consideration of a building and other structures.

Building Services (BLDG2302)

This course is designed to create a basic understanding of how the various services in buildingsare designed. Students will therefore look at water supply in buildings, waste disposal systems,lighting systems, and ventilation, among other areas.

Capstone Major Project (CMPC2401)

This project seeks to prepare the learners to design, plan, coordinate, lead and demonstrate the various skills, knowledge, and competencies developed in previous courses. This is a culminating activity that requires learners to use their creativity in developing the various components for a Construction Project that can be used in a two (2) bedroom residential

house,an industrial complex, a five (5) story apartment, and a commercial office.

It is expected that learners will complete the project in groups of four (4) or individually, incorporating the necessary guidelines, specifications, and recommendations from the Construction Technology, Drafting, AutoCAD, Measurement and Estimation, and Building Codes.The document will include completed architectural drawings, construction procedures, the services within the building, a bill of quantity, and a surveyors' diagram. The project is specifically intended to cover a realistic situation where the learner will focus on construction that meets specific requirements following the principles learned in the programme. This course is also separated into two semesters. Students will also do the consultation aspect in the third semester, followed by the project in their final semester.

Communication I (COMM1101)

This course is designed to develop the community college students' ability to write expository essays, 'projects or papers' and make oral presentations in varying contexts in and out of the classroom. It is hoped that this course will be used by students to help them fulfil the academic evaluation requirements of the courses they will sit at this level and help them to become better communicators. The course gives students practice in the manipulation of secondary sources of information to support their own ideas in writing and speech.

Communication II (COMM1202)

In order to meet the demands of the global market, one must be an effective communicator. Therefore, this course seeks to highlight the various routes of communication and also examine avariety of business documents used in communicating. This will assist learners in developing proficiency in communication. It is designed to provide students with opportunities to produce different types of oral and written communication while selecting and combining forms, media, channels, and technologies to maximize communication. Specific emphasis will be placed on producing formal business documents such as letters and reports.

Construction Technology I (CONS1201)

This course is designed to give a good theoretical background to what is essentially a practical subject and expose the students to advanced principles applied in building activities. Students will cover the built environment, site works, subsoil drainage, excavations and timbering, foundations, concrete and construction materials, shoring, scaffolding, enclosures, and elements.

Fundamentals of Information Technology (ITEC1104)

This course is designed to provide students with a comprehensive knowledge of the application of computers in different organizations. It includes a thorough introduction to computers and information technology, information systems, computer networks, and systems security. It also aims at equipping students with practical operating system, word processing, spreadsheet, and Internet search skills.

General Technology (GTEC1101)

The course comprises two main areas of Mechanical and Electrical technology. The course introduces students to the concepts and terminologies required to operate safely and effectively in a technical or industrial environment.

History of Architecture (ARCH2302)

The aim is to provide an understanding of the forces affecting architecture and the identification of the main stylistic and visual icons of the period. It will also identify the historical factors affecting the profession's tools.

Introduction to CAD (ACAD1201)

Introduction to AutoCAD is an introduction to computer-aided drafting (CAD) in two dimensions. Basic drawing commands to produce and manipulate technical drawings on a microcomputer system will be presented.

Introduction to Management (MGMT1101)

This course is designed to provide students with a comprehensive introduction to the range of decisions encountered by managers in business organizations. Emphasis will be placed on the application of the theories of management with a view to highlight the managerial functions.

Introduction to Psychology (PSYC1110)

This course is designed primarily to provide students with a general understanding and appreciation of human behaviour and its impact on social relationships. More specifically, the course will cover approaches to the study of psychology, biological and developmental bases of behaviour, perception, personality, attitude, motivation, emotions, conflict, change and stress management.

Land Surveying I (BLDG1203)

This course is structured to give students a basic, practical knowledge of the fundamental principles and applications of land surveying. Students will gain knowledge and skills by being involved in actual fieldwork. More specifically, the course will look at the nature of surveying, distance measuring and chain surveying, levelling, map work, and real estate.

Land Surveying II (BLDG2303)

This course is structured to give students a basic, practical knowledge of the fundamental principles and applications of land surveying. Students will gain knowledge and skills by being involved in actual fieldwork. Topics include the Theory of Errors, Map Production, Map Projections, and Area Computation.

Measurements and Estimating (BLDG2402)

This course is designed to help students appreciate the importance of estimating in the construction of buildings. This course involves the mathematical calculation of building components to determine material quantity and cost.

Physics I (PHYS1101)

This course is designed to expose students to selected topics in Physics relating to the building and construction industry; to give them an awareness of how the laws of physics can affect the aesthetics, strength, and design of buildings and other engineering structures.

Structures (CONS2401)

This course is designed to introduce the theory and principles of Structural Design. Topics such as equilibrium of rigid structures, bending stress, shear stress and torsion stress, beam deflection and rotation, strain energy, and virtual work are covered.

Technical Drawing (DRAW1101)

This course is designed to help students appreciate the technical language used to communicate in the technical field. The course involves the application of Technical Drawing skills at the professional level by producing construction documents (blueprints). It will develop in students the basic principles of drawing to improve their skills and thus produce more complex industrial drawings. The course will enable students to read and interpret working drawings.

Technical Mathematics I (MATH1104)

The course will introduce students to the basic Mathematical skills that will enable them to approach architectural problems analytically. This course will enable students to develop effective and efficient analytical skills as well as to appreciate the relevance of mathematics to the broad field of architecture and the building industry.

Technical Mathematics II (MATH1204)

This course will enable students to develop effective and efficient analytical skills as well as to appreciate the relevance of mathematics to the broad field of architecture and the building industry. An advanced course, students will look specifically at equations, trigonometry, limits, differentiation, and integration, among other salient areas.

Programme Requirements

Institutions seeking to offer this programme will have to demonstrate that they satisfy the minimum programme requirements indicated in the table below.

#	PREPARATORY PROGRAMME REQUIREMENTS FOR IMPLEMENTATION
1	**Required Facilities**
	Equipped Computer lab
	Equipped Skills training lab
	Adequate Classroom(s)
	Adequate Internet Access
	Equipped SEN facilities with respect to the target group
	Consider flexible learning options, where possible
2	**Learning/Training Resources Requirements (*Please indicate*)**
	Investigate the availability of curriculum, Learner Guide, Facilitator's Manual
	Investigate the availability of Library materials
	Investigate the availability of multimedia content
	Investigate the availability of repurposed content for flexible learning
	Investigate the availability of repurposed content for SEN
3	**Required training Equipment/Tools/Software/Hardware**
	Determine the delivery material requirements (e.g., electrical wires)
	Determine the required computer software/hardware
	Determine the required tools/equipment
	Determine the required online simulation resources, if applicable
	Determine the required assistive technologies based on specific SEN
4	**Human Resources Requirements**
	Determine adequacy of skill Instructors
	Determine the Instructor qualification requirements
	Determine the need for Lab Assistants
	Determine the required Assessors
	Determine the need for additional tutors to support flexible learning modality (if required)
	Determine the need for trained Instructors to support selected SEN groups
5	**Required Assessment Strategies to be Approved with the accrediting body**
	Determine the requirements for traditional assessment modes

	Determine the requirements for Blended/Flexible Assessment modes
	Determine the requirements for Special Education Needs assessment strategies
6	**Required Delivery Modality**
	Determine the requirements for flexible learning/ Blended (Developed content)
	Determine the requirements for Face to Face (Developed delivery content)
	Determine the requirements for SEN Modified Delivery Content
7	**Required Programme Budget/Costs/Fees**
	Calculate Programme delivery costs
	Calculate Student/Trainee fees
	Other costs

References

Commonwealth Network Jamaica- http://www.commonwealthofnations.org/sectors-jamaica/business/construction_and_engineering/

Construction task force (2009). Vision *2030 Construction Sector plan 2009-2030:* https://www.mtw.gov.jm/images/Bulletins/v2030construction.pdf

Labour Market Research and Intelligence Department. (2014). *2014-2015 HEART Trust NTA projected enrolment: Labour market alignment analysis*. Kingston, Jamaica: HEART Trust/NTA.

Labour Market Research and Intelligence Department. (2014). *Skills demand and employers' satisfaction survey 2014/2015*. Kingston, Jamaica: HEART Trust/NTA.

Planning Institute of Jamaica. (2014). *Economic and social survey- Jamaica 2013.* Kingston, Jamaica: PIOJ.

Programme Structure and Course Outlines

Associate of Applied Science Degree

in

Architectural and Construction Technology

THE COUNCIL OF COMMUNITY COLLEGES OF JAMAICA

COURSE NAME:	Advanced Architectural Drafting
COURSE CODE:	ARCH2303
CREDITS:	3
CONTACT HOURS:	45 (45 hours theory)
PRE-REQUISITE(S):	Architectural Drafting I
CO-REQUISITE(S):	None
SEMESTER:	

COURSE DESCRIPTION:

The course focuses on communication skills through various exercises in all aspects of drawing - composition and graphics, sketch, presentation, working drawings, and drawing of architectural elements and their detailing.

COURSE OUTCOMES:

Upon successful completion of this course, students should:

1. gain an appreciation for the resolution of different issues involved in the design process.
2. acquire the skills of drafting.
3. understand how to communicate graphically and verbally.
4. appreciate architectural graphics, which is the end product of the design process.

UNIT I – Introduction to Architectural Design (10 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. identify the compositional strategies used by architects to organize and assemble tectonic elements, which facilitate and control movement and activities within a space.
2. identify the different issues that are involved in the design process of a small residence.
3. identify the relationship between architecture and human activities.
4. demonstrate the importance and the usage of precedent in the design process.

Content:

1. The design of a small two-storey, single-family residence in a natural setting.

UNIT II – Measured Surveys (10 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. explain the importance of measured surveys.
2. record existing conditions on any structure.
3. reproduce recorded data on an existing structure or any preserved building.

Instructional approach:

Students will be divided into groups and sent to selected buildings to do a measured survey on each, after which they will be required to reproduce the data collected in drawing format.

UNIT III – Model Making (10 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. emphasize the importance of model making and the use and reuse of locally available materials in model construction.
2. demonstrate that models are usually the best means available for communicating the three-dimensional exterior and/or interior appearance of a building.
3. demonstrate that models should not only be used as a means for the final evaluation and presentation of a design but also as a tool to facilitate and help in the cohesive development of an object or building.

Content:

1. Models in the design process:
   a. Architectural Models (Conceptual models, Presentation models, Demountable models, etc.)
   b. Structural Models
   c. Acoustical Models
   d. Computer Models
   e. Engineering Models
   f. General Models

UNIT IV – Detailing of Architectural Elements (12 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. explain the coming together of parts or elements to form a whole.
2. discuss the properties and application of materials.
3. explain the effect details have on the outcome of a design.
4. develop the ability to create unique details.

The detailing of architectural elements requires a broad and universal outlook. Students will be shown examples of details of various buildings both locally and overseas, as well as a project from its inception to completion. Students will also be exposed to samples of various building materials presently available.

Content:

The following elements will be explored with particular attention to their points of intersection.

1. Foundation systems
2. Floor systems
3. Wall systems
4. Roof systems
5. Doors & Windows
6. Moisture & Thermal Protection
7. Special construction
8. Finish work

Instructional approach*:*

Students will be required to analyze a design drawing (plans, sections, elevations, photographs) of an assigned 20th Century building and to determine the details used. This analysis will then be presented through the use of annotated wall sections, details, and axonometric drawings at a large scale.

METHODS OF DELIVERY:

1. Lectures
2. Demonstrations
3. Discussions
4. Group Work
5. Presentations

6. Field Trips
7. Laboratory activities

METHODS OF ASSESSMENT AND EVALUATION:

1. Common Coursework	40%
2. Presentation/Portfolio	20%
3. Major Project (Model)	40%

RESOURCE MATERIAL:

Prescribed:

Frank, C. (2009). *Architectural Graphics* (5th ed.). New Jersey, NJ: Wiley.

Recommended:

Muller, J. E., & Grau, A. P. (2008). *Architectural Drawing and Light Construction.* (8th ed.). New Jersey, NY: Prentice-Hall.

Ramsey G. C., Sleeper, H. R., & Bassler. B. (2008). *Architectural Graphic Standards* (11th ed.). New Jersey, NJ: Wiley.

Websites:

EBSCOhost database- https://www.ebscohost.com/

THE COUNCIL OF COMMUNITY COLLEGES OF JAMAICA

COURSE NAME:	Advanced Construction Technology
COURSE CODE:	CONS2302
CREDITS:	3
CONTACT HOURS:	75 (30 hours theory, 45hours lab)
PRE-REQUISITE(S):	Construction Technology I (CONS1201)
CO-REQUISITE(S):	None
SEMESTER:	III

COURSE DESCRIPTION:

An advanced course, students will cover technical and practical aspects of the following topics: Structural Steel Work Frames, Stairs, Piled Foundations, Demolition, Contract Administration, Claddings, Fire Prevention, Sound Insulation, Thermal Insulation, and Builders Plant, Land Economy, associated with level two (2) practical workforce development.

COURSE OUTCOMES:

Upon successful completion of this course, students should:

1. understand the concepts of working with steel, concrete, and wooden frames.
2. outline the processes and procedures in preparing and conducting a demolition exercise.
3. understand the principles and procedures of underpinnings.
4. prepare various contracts in relation to construction, i.e., bids, bonds, tenders, etc.
5. outline the legal procedures to be taken when preparing contracts.
6. demonstrate ways in which fire can be prevented.
7. understand principles and procedures for plant and builders' plant usage on site.
8. understand the nature of the land economy.
9. demonstrate and do practical activities associated with guarantee level 2.

UNIT I – Structural Wood, Concrete and Steel Work Frames and Claddings (10 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. sketch structural steel work connections.
2. explain the nature of a steel frame.
3. state the advantages and disadvantages associated with steel frames, concrete, and wood frames.
4. explain the footing details of fixing a steel portal frame (with the aid of a diagram).
5. differentiate between a welded and bolted steel frame joint.
6. with the aid of a diagram, explain the nature of the following joints: haunch, elbow, and apex.
7. compare steel frames with other frames.
8. explain the term roof truss (concrete, wood, and steel).
9. evaluate in-situ and pre-cast concrete frames.
10. explain the footing details of fixing a concrete portal frame (with the aid of a diagram).
11. explain the nature of a wooden frame.
12. define the term cladding.
13. differentiate between the two classifications of cladding.
14. identify at least 4 cladding materials.
15. sketch cladding arrangements.
16. create cladding arrangements for various framing members.
17. construct a small scaled-down wood frame (optional to the lecturer).
18. name flooring members of a balloon-framed building.
19. compare the fixing arrangements for a fixed portal frame and a two **or** three-pinned portal frame.
20. draw and label a typical single-span portal frame.
21. draw and label the typical hinge details for a pre-cast concrete portal frame.
22. construct a small, scaled truss roof.

Content:

1. Structural steel, concrete, and timber frames for buildings.
2. Truss steel roof frames.
3. Steel frame joints: footings, elbow joints, apex joints, truss joints.
4. Steel, concrete, and wooden portal frame connections: pocket, base plate, pin or hinge, fixed portal frame, two and three pinned portal frames.
5. Steel/concrete/timber (where applicable) framing joints: welded, webbed/latticed, bolted, haunched, spliced, riveted/wedged/pinned.
6. Cladding types and arrangement.

UNIT II – Demolition (5 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. list the different types of demolition.
2. explain the difference between taking down and demolition.
3. discuss the theories and methods employed in demolition works.
4. assess the factors to be considered when selecting a demolition method.
5. discuss each type of demolition: hand, pusher arm, deliberate collapse, ball technique, wire rope pulling, explosive, gas expansion burster, hydraulic burster, thermic lance demolisher, thermal reaction demolisher.
6. explain with the use of sketches how materials are removed from demolished sites with rubble chutes, skips and dumpsters.

Content:

1. Demolition.
2. Pre-demolition survey, statuary notices, and safety requirements.
3. Methods of demolition.
4. Removal of demolished materials.

UNIT III – Stairs (10 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. identify the different parts of a stair.
2. explain the functions of stairs.
3. make sketches of the following stair types: straight flight, dog-legged, spiral, winder, and quarter turn.
4. compare and contrast the different types of stairs (material and style).
5. explain four (4) advantages of pre-cast concrete stairs.
6. make a graphical representation of the types of stairs in the form of plan and elevated views.
7. sketch the sectional view of concrete stairs to show the joint at the landing and the top of the flight for in-situ **or** pre-cast concrete stairs (project).
8. discuss conditions that must be met when building reinforced concrete stairs with simple formwork:
   a. Concrete mix
   b. Minimum cover

c. Waist thickness
d. Type of steel handrails

Content:

1. Timber, metal, and concrete stairs.
2. In-situ and pre-cast concrete stairs.
3. Stairs calculation.

UNIT IV – Underpinning Basement Excavation (12 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. explain the term ‘underpinning’.
2. explain three reasons why underpinning will become necessary.
3. outline the procedures to be followed when underpinning a foundation.
4. sketch and label a suitable underpinning schedule.
5. make sketches of wall underpinning arrangements.
6. research the various methods of underpinning.
7. assess four (4) site surveys and preliminary work that may be undertaken prior to underpinning.

Content:

1. Underpinning
2. Reasons for underpinning
3. Types of underpinning
4. Procedures used to underpin a foundation
5. Underpinning schedule
6. Wall underpinning arrangement
7. Research different methods of underpinning
8. Four site survey and preliminary work

UNIT V – National Building Code and Regulation (10 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. identify the various types of commercial and industrial buildings.
2. discuss the various building groups, types, and classifications by construction.
3. discuss the fire-resistance rating for building special provisions.
4. determine the occupancy content of a building.
5. discuss the requirement for the following areas as mentioned within the National Building Code:
    a. Natural light and ventilation –
    b. Minimum areas and dimensions of habitable rooms –
    c. Seating arrangement of public assembly –
    d. Private stairways/ - common stairways
6. identify means of escape and exits.
7. determine staircases and ramps.
8. explain the automatic sprinkler system.
9. identify fire resistance rating for materials.
10. state the statutory role of building inspectors.
11. explain the distinction between building regulations and building codes and how they apply to development.
12. examine the inspector's checklist that builders/developers should adhere to in order to get approval for construction.

Content:

1. General; Public Health and Safety Requirements.
2. Fire Protection System Escape and Exits.
3. Material and Construction Standards.
4. The Role of the Building Inspector.

UNIT VI - Construction Management (18 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. explain the terms contract, tender, contract bond, insurance bond, performance bond, and bid bond.
2. explain the risks that may be experienced during the contract process.
3. compare the different types of building contracts.
4. explain what a tender document is.
5. evaluate the procedures used in tendering.
   research contract health and safety requirements in building construction.
6. explain the purpose of a contract bond.
7. explain the purpose of a bid **or** insurance bond.
8. explain the nature of a performance bond.
9. evaluate the use of bonds in the construction industry.
10. define land economy.
11. land economy concepts:
    a. Analyze and manage land economy changes.
    b. Interpret changes in the use of property.
    c. Assess measures to restore and create environments with natural resources.
    d. Describe financial laws as they relate to land economic development and resources management.
12. discuss the economy of the built environment.
    a. Explain the construction sector as a macroeconomic element.

Content:

1. Construction contracts
2. Health and safety policy
3. Contract documents
4. Categories of contracts
5. Types of contracts
6. Contract implications
7. Contract risk
8. Tendering bidding
9. Contract insurance and performance bonds
10. Land economics
11. The public and private sector policies and legal institutional framework
12. Qualitative and quantitative methods for legal land economy

13. Land economy development and sustainability.
    a. Landlord and tenant law
    b. Planning policies and practice
    c. Land policies and development economics
14. Finance and investment within the land economic sector
15. The built environment
16. Land: land development and urban economic development

UNIT VII – Sound Insulation (4 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. differentiate between sound and noise.
2. explain how sound is detected and measured.
3. describe how sound travels.
4. differentiate between high-pitched and low-pitched sounds.
5. explain how noise can become noise pollution.
6. explain how sound can be controlled.
7. evaluate which materials are best suited for sound barriers.
8. draw and label diagrams depicting how materials and acoustics elements are formulated to capture sound.

Content:

1. Sound and noise
2. Sound detection and measurement
3. Sound pollution
4. Sound insulation

UNIT VIII – Builders Plant (6 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. discuss the advantages and disadvantages of plant usage on site.
2. give at least five reasons for the use of a builder's plant on site.
3. examine the different classifications of plant items and their usage.
4. calculate the yearly working hours for a builder's plant.
5. list the different types of plants under each of these classifications of plant items: small, powered plants, earth moving plants, excavation plants, transporting plants, mixers, and

pumps.

6. explain the usage of plants under the classification of plant items: small powered plants, earth moving plants, excavation plants, transporting plants, mixers, and pumps.
7. analyze at least (5) five advantages of buying a builder's plant.
8. compare the advantages of buying a builder's plant and hiring one.
9. list six (6) important checks to be made on building plants as preventative maintenance checks.
10. discuss the noise pollution control for plants.

Content:

1. Builders plants
2. Small powered plants
3. Earth moving plants
4. Excavation plants
5. Transporting plant
6. Mixers and pumps

METHODS OF DELIVERY:

1. Lectures
2. Worksheets
3. Audio and tape evaluations
4. Discussions
5. Peer Conferencing
6. Presentation(s)
7. Research
8. Field Trips
9. Quizzes

METHODS OF ASSESSMENT AND EVALUATION:

1. Common Coursework 50%
2. Final Examination 50%

RESOURCE MATERIAL:

Prescribed:

Chudley, R., & Green, R. (2012). *Advanced Construction Technology* (5th ed.). Prentice Hall (UK).

Recommended:

Chudley, R. & Green, R. (2010). *Building Construction Handbook* (8th ed.). Burlington, MA: Butterworth-Heinemann.

Iano, J. & Allen, E. (2014). *Fundamentals of Building Construction: Materials and Methods* (6th ed.). New Jersey, NJ: Wiley.

Online Resources:

Springer E-Books- www.springer.com

Ebscohost Databases- www.ebscohost.com

THE COUNCIL OF COMMUNITY COLLEGES OF JAMAICA

COURSE NAME:	Architectural Drafting I
COURSE CODE:	ARCH1201
CREDITS:	3
CONTACT HOURS:	45 (45 hours theory)
PRE-REQUISITE(S):	None
CO-REQUISITE(S):	None
SEMESTER:	III

COURSE DESCRIPTION:

The course will introduce students to the foundation and basic technical skill of drafting. It will familiarize students with the fundamental principles of architectural drafting as it relates to the architectural profession.

The first section of the course will cover the basic techniques of tine lettering scale and symbols and followed by single and multi-view drawing details and working drawings.

COURSE OUTCOMES:

Upon successful completion of this course, students should:

1. understand drafting techniques from inception to the working drawings stage.
2. acquire efficient drafting skills.
3. understand how to communicate graphically.
4. appreciate architectural graphics, which is the end product of the design process.

UNIT I – Introduction (6 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. describe the different instruments used in drafting.
2. explain how to use the different instruments used in drafting.
3. identify the various types of lines.
4. demonstrates how to draw the various lines.
5. identify the different symbols used in architecture.
6. demonstrate the use of scale.
7. draw different types of scales.

Content

1. Drafting equipment and supplies
2. Line work
3. Lettering
4. Lines, scales, and symbols

UNIT II – Multi-View Drawings (6 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. complete the Orthographic drawings of a building.

Content

1. Orthographic Projection.
2. Floor Plan at Presentation.
3. Section at Presentation.
4. Elevations at Presentation (Front, left end, right end, and rear end).

UNIT III – Single-View Drawings (8 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. construct Isometric Drawings.
2. construct Plan Oblique Drawings.
3. construct Elevation Oblique Drawings.
4. construct Axonometric Drawings.

Content:

1. Isometric
2. Plan Oblique
3. Elevation Oblique
4. Axonometric

UNIT IV – Graphics Presentation (8 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. demonstrate the use of tonal values on a set of drawings.
2. identify shade and shadow.
3. construct shade and shadow.

Content

1. Tonal Values
2. Shades and Shadows
3. Material Rendition

UNIT V – Detailing (7 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. draw the various types of detail for a small house.
2. interpret the different details.

Content

1. Eave Details
2. Ridge Details
3. Valley Details
4. Foundation Details
5. Window and Door Schedule
6. Wall Section
7. Stairs Details
8. Plumbing Details

UNIT VI – Working Drawings (10 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. prepare working drawings/plans.

Content:

1. Floor Plan
2. Sections
3. Elevations
4. Roof Framing Plan
5. Location and Site Plan
6. Plumbing Plan
7. Electrical Plan
8. Foundation Plan

METHODS OF DELIVERY:

1. Lectures
2. Demonstrations
3. Project
4. Group Work
5. Presentations
6. Field Trips
7. Laboratory activities

METHODS OF ASSESSMENT AND EVALUATION: Continuous Assessment

1. Common Coursework	40%
2. Presentation	20%
3. Major Project	40%

RESOURCE MATERIAL:

Prescribed:

Jefferis, A., Madsen, D., & Maden, P. D. (2010). *Architectural Drafting and Design* (6th ed.).

Florence, KY: Delmar Cengage Learning.

Recommended:

Cline, L. (2007). *Architectural Drafting for Interior Designers.* Florence, KY**:** Delmar Cengage

Learning.

Helper, D. J., Wallach, R. P., & Helper, D. (2008). *Drafting and Design for Architecture* (8th ed.).

Florence, KY**:** Delmar Cengage Learning.

Websites:

Ebsocohost database- https://www.**ebscohost**.com/

Springer E-Books- http://link.springer.com/

THE COUNCIL OF COMMUNITY COLLEGES OF JAMAICA

COURSE NAME:	AutoCAD Applications
COURSE CODE:	ACAD2301
CREDITS:	3
CONTACT HOURS:	**7**5 hrs. (30 hours theory, 45 hours practical)
PRE-REQUISITE(S):	Introduction to AutoCAD
CO-REQUISITE(S):	None
SEMESTER:	III

COURSE DESCRIPTION:

This advanced course is designed to further develop the student's knowledge of AutoCAD and its application and integration with other software such as Microsoft Word. This will involve programme application and co-ordination of computer systems and networks, with particular reference to the production of architectural working drawings, storage, schedules, programs, and applications for an architectural project.

COURSE OUTCOMES:

In this course students will be required to produce:

1. a complete working drawing of a five-bedroom two-storey dwelling house, at the professional level, by applying knowledge and skill obtained in the introductory course. (During semester three, 40% per cent of final grade)

2. a complete working drawing of a small commercial building, at the professional level, by applying knowledge and skill obtained in the introductory course. (During the fourth semester, 50% of final grade)

In order to meet these objectives, a continuous review of the previous course [Introduction to AutoCAD] will be done in parallel with the lessons taught.

UNIT I – Setting up the Drawing Environment and Working with Drawing Files (5 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. know the different save commands.
2. create and save drawing templates.
3. save drawings.

Content:

1. Save commands
2. Drawing templates

UNIT II – Creating Drawing Aids (7 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. use the different drawing tools.
2. define the drawing environment.
3. control drawing perimeters from within a drawing.

Content:

1. Drawing tools
2. Drawing environment
3. Drawing perimeters

UNIT III – Drawing and Controlling Lines (7 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. draw lines using different line commands.
2. locate lines using coordinate entry methods.
3. control and edit lines.

Content:

1. Line commands.
2. Coordinate entry methods.

UNIT IV – Drawing Organization (7 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. know and create different line types.
2. assign line colour and weight.
3. assign layers to lines.

Content:

1. Line types
2. Line colour and weight
3. Line layers

UNIT V – Drawing Geometric Shapes (7 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. draw the following geometric shapes:
   a. Circles
   b. Arcs
   c. Donuts
   d. Ellipses
   e. Polygons
   f. Rectangles

Content:

1. Geometric shapes drawings.

UNIT VI – Controlling Drawing Accuracy and Drawing Display Options (7 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. control the aperture box.
2. control drawing settings.
3. use OSNAP modes.
4. use the different aspects of the zoom command, pan command, view command, aerial view command, and refreshing the screen.

Content:

1. Aperture box
2. Drawing settings
3. OSNAP modes
4. Using display Options

UNIT VII – Setting and Modifying Drawing Objects (7 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. select objects for editing.
2. define the selection mode.
3. modify a drawing using erase.
4. modify a drawing by adding objects.
5. modify drawings by altering their position and size.
6. modify drawings by altering lines.
7. select objects with grips.
8. select objects for multiple edits.
9. name object groups.

Content:

1. Setting and modifying objects.

UNIT VIII – Supplemental Drawing Commands (7 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. mark and divide space.
2. draw lines of varied width and length.
3. create lines using the XLINE command.
4. draw with multiple lines.

5. edit multiple lines with grips.
6. edit multiple lines using MLEDIT.
7. use the U command.

Content:

1. Supplemental drawing commands.

UNIT IX – Polylines, Controlling Lines and Layers (7 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. know and use the polyline command.
2. edit a polyline.
3. alter a polyline with PEDIT.
4. control line types.
5. name and control layers.
6. alter line types, colours, and layers.

Content:

1. Polyline command
2. Controlling lines
3. Controlling layers

UNIT X – Placing Patterns in Drawing Objects and Inquiry Commands (7 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. use different hatch methods to hatch objects.
2. use the QUICK TAB.
3. define boundary hatch using the advanced tab.
4. edit hatch patterns.
5. determine distance.
6. determine area.
7. mass properties.
8. list drawing information.
9. obtain information about a drawing.
10. identify a point.

11. track drawing times.
12. determine drawing status.
13. use the AutoCAD calculator.

Content:

1. Placing patterns in drawing objects.
2. Inquiry command.

UNIT XI – Pictorial Presentation (7 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. use Rivet and AutoCAD to produce 3D drawings.
2. demonstrate how to Orbit the 3D drawings.

Content:

1. 3D drawings using Rivet.
2. 3D drawings using AutoCAD.
3. Orbit 3D drawings.

METHODS OF DELIVERY:

1. Lectures
2. Demonstrations
3. Discussions
4. Group Work
5. Presentations
6. Field Trips
7. Laboratory works
8. Projects
9. Computer-based activities

METHODS OF ASSESSMENT AND EVALUATION: Continuous Assessment

1. Coursework/Class Participation	10%
2. Major Project – Individual	40%
3. Major Project – Group	50%

Breakdown of hours

Classroom lectures	**2 hours/week**
Tutorial/Lab	**4 hours/week**

RESOURCE MATERIAL:

Prescribed:

Aubin, F. P (2009). *Mastering AutoCAD Architecture 2010* (7th ed.). Autodesk Press.

Palma, M. R. & Maden, A. D. (2004). *Architectural Drafting Using AutoCAD: Drafting, Design*.

Goodheart-Wilcox.

Websites:

Ebscohost database- https://www.ebscohost.com/

Springer E-Books- http://link.springer.com/

THE COUNCIL OF COMMUNITY COLLEGES OF JAMAICA

COURSE NAME:	Building Science
COURSE CODE:	BLDG1201
CREDITS:	3
CONTACT HOURS:	45 (45 hours theory)
PRE-REQUISITE(S):	
CO-REQUISITE(S):	
SEMESTER:	III

COURSE DESCRIPTION:

This course is to introduce the fundamental aspects of building mechanics and material science that impact the design and structural considerations of buildings or other structures.

COURSE OUTCOMES

Upon successful completion of this course, students should:

1. apply principles, the nature, and types of forces on structures.
2. understand the basic methods and techniques in assessing the stability of structures.
3. understand the methods and techniques in assessing the resultant of forces.
4. evaluate the legal and economic aspects of design structure serviceability.
5. understand the moments and principles of a lever.

UNIT I – Calculations of Forces (7 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. determine the resultant of two intersecting forces.
2. determine the resultant of concurrent forces.
3. resolve a given force into a rectangular component.

Content:

1. Resultant of two intersecting forces.
2. Resultant of concurrent forces.
3. Rectangular components of a force.
4. Bow's notation.
5. Triangular forces.
6. Polygon of forces.

UNIT II – Forces Applied to Solid Materials (7 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. explain the terms: tension, compression and shearing as applied to materials.
2. explain the intensity of stress as applied to solid material.
3. explain a strain as applied to solid materials.
4. use the loading extension graph to derive Hooke's Law.
5. find Young's Modulus of elasticity for different materials given the tension stress and strain.
6. find the modulus of rigidity for different materials given the shear stress and strain.
7. describe an experiment to find the ultimate tensile stress of a material.
8. examine the factor of safety in the application of force to materials.
9. explain the types of simple force as applied to a material.
10. define stress and strain as it relates to a solid material.
11. determine the resultant of two intersecting forces.
12. derive Hooke's law by using a loading extension graph.
13. find the Young Modulus of elasticity of different materials.
14. show the relationship between young modulus and Hooke's law.
15. determine the factor of safety.

Content:

1. Types of simple stress.
2. Intensity of stress.
3. Working stress.
4. Factor of safety.
5. Relationship between stress and strain.
6. Hooke's law.
7. Youngs' Modulus.
8. Safety procedures used in the application of force to solid materials.

UNIT III – Parallel Forces (7 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. explain the concepts of equilibrium under the action of parallel forces.
2. demonstrate how levers can be used to illustrate the principle of moments.
3. calculate the reaction forces at a certain point or points of a loaded beam on supports.
4. state the conditions for equilibrium for parallel forces.
5. explain how a coupling force results in a turning force or torque.

Content:

1. Calculate the resultant forces.
2. Resolution of forces of rectangle component.
3. Stability under-non-current force system.

UNIT IV – The Effects of Environmental Factors that Affect Building Material (5 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. explain the effects of environment factors on building structure, for example, semi, flooding, wind, etc.
2. explain how we can put things in place to mitigate these factors, for example, design, material, building code, and building procedures).

Content:

1. Condensation/ humility in buildings.
2. Deteriorating effect of air/wind on metals, concrete, and wood.
3. The effects of sunlight on different types of concrete, wood, and metal.
4. The effects of lighting on buildings and the types of protectors.
5. The effects of earthquakes on buildings.

UNIT V – Simple Beams – Bending Moments and Shear Force (8 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. describe basic techniques for assessing bending movements and shear forces in simple beams.
2. draw bending moment and shear force diagrams for the simple beams.

Content

1. Cantilever with single point load at the free end.
2. Cantilever with several point loads.
3. Cantilever with uniformly distributed loads.
4. Simply supported beam with single point load.
5. Simply supported beam with several point loads.
6. Simply supported beam with uniformly distributed loads.

UNIT VI – Composite of Building Material (8 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. explain the types, composition and properties of cement, rock, and sand.
2. explain the types, composition, and properties of soil.
3. explain the nature, types, properties, and applications of hard and soft – wood as used in/on buildings.
4. discuss the nature, types, properties, and applications of ply-board and super-board.
5. explain the polymer structure.
6. classify polymeric materials.
7. explain polymerization.

8. discuss polymer additives.
9. explain the properties of polymers.

Content

1. Classification of cement
2. Compositions and properties of cement
3. Aggregates
4. Nature of timber
5. Hydrocarbon molecules
6. Molecular structure
7. Molecular shape
8. Thermoplastic polymers
9. Thermosetting polymers
10. Polymerization
11. Addition polymerization
12. Condensation polymerization
13. Polymer additives
14. Properties of polymers

METHODS OF DELIVERY:

1. Lectures
2. Demonstrations
3. Project
4. Group Work
5. Research

METHODS OF ASSESSMENT AND EVALUATION:

1. College Coursework:		**40%**
a. Projects and Presentation	20%	
b. Field Observation Report (individual)	20%	
2. Mid-Term Test		**20%**
3. Examination		**40%**

Recommended text:

Reynolds, T.J., Kent, L.E. & Lazenby, D.W. (1983). *Introduction to Structural Mechanics*. McGraw Hill pub. USA.

Online Resources:

Ebscohost database- https://www.ebscohost.com/

Springer E-Books- http://link.springer.com/

THE COUNCIL OF COMMUNITY COLLEGES OF JAMAICA

COURSE NAME:	Building Services
COURSE CODE:	BLDG2302
CREDITS:	3
CONTACT HOURS:	45 (45 hours) theory)
PRE-REQUISITE(S):	None
CO-REQUISITE(S):	None
SEMESTER:	III

COURSE DESCRIPTION:

This course is designed to create a basic understanding of how the various services in buildings are designed. Students will therefore look at water supply in buildings, waste disposal systems, lighting systems and ventilation, among other areas.

COURSE OUTCOMES:

Upon successful completion of this course, students should:

1. understand the distribution of water supply in buildings.
2. appreciate waste disposal systems.
3. understand the procedures involved in installing lighting systems.
4. know the various types of ventilation systems.
5. appreciate the use of electricity in the installation of lighting systems.

UNIT I – Water Supply in Buildings (9 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. explain the principles of the rising main and the down effect.
2. describe the use of stop cocks/valves/joints in water supply in buildings.
3. analyze three (3) methods of heating water.
4. differentiate between cold and hot water distributions in buildings.
5. draw the layout for water distribution up and down a high-rise building.
6. describe the use of tanks in water distribution above ground.
7. assess the use of pumps and gravity feed in water distribution above ground.
8. differentiate the types of water utilized within a high-rise building.
9. explain the steps involved in treating water.

Content:

1. Principles of rising main and down effect.
2. Utilization of stop clocks/valve joints.
3. Different methods of heating water.
4. Cold Water Distribution (low rise).
5. Hot Water Distribution (low high rise).
6. Utilization of tanks in water distribution systems.
7. Pumps and gravity feed in an above-ground water distribution system.
8. Steps involved in treating water.

UNIT II – Waste Disposal System (WDS) (8 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. explain technical jargons used in a waste disposal system.
2. describe above ground pipe system and stacks used in the waste disposal system.
3. differentiate the types of drainage pipes.
4. explain with the use of diagrams how a pipe system is developed for waste disposal.
5. draw the sectional structure of a manholes.
6. compare different methods of joining drains.

7. calculate invert levels for the waste disposal system.
8. describe how waste disposal pipes are bedded.
9. explain the three (3) methods of testing drainpipes.
10. evaluate the use of the septic tank and the absorption pit in WDS.

Content:

1. Jargons – waste disposal system, drainage pipes, vents, septic tanks, grey water, manhole, etc.
2. Above Ground – pipe system, stack.
3. Below Ground – planning, pipe system.
4. Diagram of waste disposal system.
5. Sectional structure of manholes.
6. Methods of joining drains.
7. Manholes, on-site sewage disposal systems.
8. Calculation of invert levels for WD system.
9. Bedding of waste disposal pipes and drains.
10. Methods of testing drainpipes.
11. Septic tank and absorption pits in WDS.

UNIT III – Lighting Systems (8 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. explain the nature of natural light.
2. differentiate the types of radiation.
3. describe the different types of lamps.
4. examine the lighting design criteria for buildings.
5. identify the different types of lighting controls used in buildings.
6. identify fittings required for lighting fixtures on buildings.
7. explained how combined lighting is used in buildings.

Content:

1. The nature of natural light.
    a. Definition of natural light and its source.
    b. The Electromagnetic Spectrum.

    c. Properties of Electromagnetic Waves.
2. Types of radiation.
    a. Visible radiation. (White light, Monochromatic light)
    b. Non-visible radiation. (Infrared, Ultraviolet)
3. Types of lamps:
    a. Incandescent
    b. Discharge
    c. Tungsten Filament
    d. Fluorescent
4. Lighting Design
    a. Illuminance levels
    b. Service illuminance
    c. Standard service illuminance for different locations
    d. Calculation of the required number of lamps
    e. Design suitable layout from calculations
5. Lighting Criteria:
    a. Light quantity
    b. Natural light
    c. Colour quality
    d. Glare
    e. Directional quality
    f. Energy use
    g. Costs
    h. Physical property
6. Lighting Controls
    a. Timer control
    b. Daylight control
    c. Occupation control
    d. Local switching
7. Lighting Fixtures
    a. Conduits and types
    b. Cables and types
    c. Switches and types
    d. Receptacles and types
    e. Circuit breakers and types

f. Control panel

8. Combined Lighting
    a. Concept of combined lighting
    b. Permanent Supplementary Artificial Lighting of Interiors (PSALI)
    c. Examples of (PSALI)
    d. Choice of lamps
    e. Switching systems

UNIT IV – Ventilation/ Air Conditioning (8 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. differentiate natural and artificial ventilation.
2. explain the objectives of ventilating a building.
3. explain ventilation rates for different locations.
4. identify factors to consider when designing ventilation systems.
5. identify the types of natural ventilation.
6. identify the types of mechanical fans used in ventilation systems.
7. explain the term air conditioning and the principles that govern its operation.
8. differentiate the types of air conditioning system.
9. identify the parts of the air conditioning system and their uses.

Content:

1. Definition of ‘natural’ and ‘artificial’ ventilation.
    a. Definition of natural ventilation.
    b. Definition of artificial ventilation.
2. Objectives of ventilating a building.
    a. How to supply oxygen to buildings.
    b. How to remove carbon dioxide, heat, odours, smoke, and dust.
    c. How to remove micro-organisms, mites, mould, and fungi.
    d. How to remove combustion products from heating and cooking.
    e. How to remove ozone gas from photocopiers and printers.

3. Ventilation rates for different locations.
    a. Commercial kitchens
    b. Restaurants (with smoking)
    c. Classrooms
    d. Offices
    e. Domestic rooms
    f. General occupied rooms
4. Factors to consider when designing ventilation systems.
    a. Air volume
    b. Air movement
    c. Air distribution
    d. Temperature change
    e. Humidity change
    f. Air filtration
    g. Feedback and control
    h. Energy conservation
5. Types of natural ventilation
    a. Air pressure difference
    b. Stack effect
    c. Rapid ventilation
    d. Trickle ventilation
    e. Extract ventilation
6. Types of mechanical fans:
    a. Centrifugal fan
    b. Propeller fan
    c. Extractor fan
    d. Mixed flow
    e. Crossflow
7. Air conditioning:
    a. Define air conditioning
    b. Principles of air conditioning
8. Types of air conditioning systems:
    a. Window unit a/c

b. Split unit a/c
c. Tower a/c
d. Cassette a/c
e. Cube a/c

9. Parts of the air-conditioning system and their uses.
    a. Mixing chamber
    b. Filter
    c. Preheater
    d. Chiller
    e. Humidifier
    f. Reheater
    g. Centrifugal fan

UNIT V – Electricity (9 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. explain the terms ‘power supplies’ and ‘systems’.
2. describe the process used to generate electrical power by different power stations.
3. summarize how electrical power transmission systems operate and how its control.
4. illustrate the general distribution of electrical power from the power station to different buildings.
5. draw and label electrical installation for residential buildings.
6. describe six (6) renewable and three (3) non-renewable forms of energy and the importance of energy conservation.

Content:

1. Power supplies and systems.
    a. Definition of power supplies and systems.
    b. The importance of public electrical supply for the built environment.
    c. The importance of power systems. (Generation, Transmission and Distribution).
2. Power stations.
    a. The basic concept of generating electrical power

b. Steam turbine power station
c. Nuclear power stations
d. Wind farms
e. Hydro-electric power plant
f. Solar power plant

3. Transmission and control.
    a. How electrical energy is transmitted
    b. Transmission lines
    c. Switching and sub-stations
    d. Power grid
4. General distribution.
    a. Power station and generator transformer
    b. Switching station
    c. Bulk power substation
    d. Distribution substation
    e. Local substation
    f. Distribution transformer
5. Electrical installation for residential buildings.
    a. Basic electrical installation concepts.
    b. Factors to be taken into account before distributing electricity within a building.
    c. Features of domestic electrical installation.
    d. Diagram of an electrical installation.
6. Renewable and non-renewable forms of energy.
    a. Six (6) types of renewable forms of energy.
    b. Three (3) types of non-renewable forms of energy.
    c. The importance of energy conservation.

METHODS OF DELIVERY:

1. Lectures
2. Demonstrations
3. Project
4. Group Work
5. Presentations
6. Field Trips

7. Simulation
8. Research

METHODS OF ASSESSMENT AND EVALUATION:

1. Mid-Term Test	**30%**
2. Common Coursework	**30%**
3. Final Examination	**40%**

Recommended:

Iano, J., & Allen, E. (2008). *Fundamentals of Building Construction: Materials and Methods* (5th ed.). New Jersey, NJ: Wiley.

Leslie, T., & Alread, J. (2006). *Design-Tech: Building Science for Architects*. Oxford, United Kingdom: Architectural Press.

Online resources:

Ebscohost database- https://www.ebscohost.com/

Springer E-Books- http://link.springer.com/

THE COUNCIL OF COMMUNITY COLLEGES OF JAMAICA

COURSE NAME:	Capstone Major Project – Construction
COURSE CODE:	CMPC2401
CREDITS:	2
CONTACT HOURS:	60 (15 hours theory and 45 hrs practical based activity)
PRE-REQUISITE(S):	Completion of **ALL** Core Courses for ADACT
CO-REQUISITE(S):	None
SEMESTER:	III

COURSE DESCRIPTION

This project seeks to prepare the learners to design, plan, coordinate, lead and demonstrate the various skills, knowledge and competencies developed in previous courses. This is a culminating activity that requires learners to use their creativity in developing the various components for a Construction Project that can be used in a two (2) bedroom residential house, an industrial complex, a five (5) story apartment and a commercial office.

It is expected that learners will complete the project in groups of four (4) or individually, incorporating the necessary guidelines, specifications and recommendations from the Construction Technology, Drafting, AutoCAD, Measurement and Estimation and Building Codes. The document will include completed architectural drawings, construction procedures, the services within the building, a bill of quantity and a surveyors' diagram.: The project is specifically intended to cover a realistic situation where the learner will focus on construction that meets specific requirements following the principles learned in the programme.

A group/individual presentation of the project will be done lasting 25 – 30 minutes on the main highlights of the project, including any assumptions or challenges. The introductory aspect of the course commences in the penultimate semester and will be completed in the final semester of the programme. This will allow the learners adequate time to prepare research, consult professionals and troubleshoot their project before final submission and presentation. This course is also separated into two semesters. Students will do the consultation aspect in the third

semester, followed by the project in their final semester.

COURSE OUTCOMES

Upon successful completion of this course, students should:

1. plan and design buildings according to building code and specifications for the following:
   a. Two-bedroom residence
   b. Four-bedroom residence
   c. Small commercial building/ office
2. draw, label and interpret blueprints and building drawings.
3. work in a team.
4. apply theoretical principles in construction technology systems.
5. use Computer-Aided Design (CAD) technology in architectural design.
6. install and test a different service according to relevant codes.
7. assess the feasibility of the proposed building.
8. construct logical and physical designs of the water system.
9. develop a functional system.
10. produce documents related to drainage, water and electrical proposal and implementation.
11. demonstrate health and safety precautions and procedures in a work environment.
12. infuse Green Technology in the construction design.
13. complete a model of the building ventilation of lighting to floor space.

REQUIREMENTS

Students are expected to apply the knowledge learnt in the following areas: AutoCAD, Architectural Drafting, Building Services, Building Science, Construction Technology, Measurement and Estimation, Land Surveying and Structures. In order to successfully complete the document/ project, the learner must consult with their advisor, document their work using APA format and display originality and creativity in the various components of the project. The group must develop a scaled model, scaled drawing using AutoCAD, a surveyor's diagram, and a type of plumbing and electrical system.

Submission Requirements

You are required to submit the following:

1. Brief description of the project and its rationale.

2. Blueprints layouts of the structures in **Outcome 1 a – c** in hard/soft copy.
3. Softcopy of the CAD for each structure on CD/ DVD.
4. Documentations of the systems within the building.

Presentations: In-Class 10%

Each group will be required to make two (2) presentations (10 minutes each), the first at the end of the penultimate semester and the second in the third week of the final semester. Presentations should provide information on the status of the project, techniques utilized, and problems encountered.

A brief description of:

1. Working drawing.
2. The Model must be shown in a PowerPoint presentation.
3. Building codes and regulations must be applied to the project.

Presentations will be graded and contribute to 10% of the overall grade.

Time Log

Each student is required to keep a time log of project activities, such as meeting dates, research time, data gathering, etc.

Individual Report 10%

Each learner is required to present an individual report of no more than five (5) pages relating the activities, difficulties, assumptions made, lessons learnt, techniques or new techniques employed in completing the project etc. The report should include a summary of their time log. This ***individual report contributes to 10% of the overall grade***.

Final Deliverable 80%

The final assignment is due within the tenth (10^{th}) week of the final semester of the programme. Students should submit a written document and do a final presentation by group members of the project. All group members must be present except in extreme circumstances.

The final Report and final Presentation are worth 80% of the overall grade. Ten per cent (10%) of this grade will be allocated to:

1. ***Creativity*** ***5%***

2. ***Grammar/use of language*** ***5%***

Mark Scheme – Capstone Project (70%)

Deliverable 1: Overview of Project **(5%)**
a. **Cover page** (title, course, name etc.) b. **Table of Content** c. **Introduction/overview** (description, assumptions, problems) d. **Acknowledgement**
Deliverable 2: Architecture and Construction **(15%)**
a. Site Analysis - Looking at the natural features, including wind direction, sun direction, type of soil, available resources for construction and the surrounding neighbourhood. b. Surveying diagram - which is a topographic survey diagram of the area. c. Design and draw - complete all the necessary plans up to parish council standard. d. Model - complete building model inclusive of the landscape. e. Bill of quantity for sub-structure of the building. f. Building services - Ventilation - makes use of natural ventilation over artificial ventilation Water supply - hot/cold water supply Drainage system - below-ground drainage Electrical Supply - (JS21)
Deliverable 3: **Building Codes and Standard** **(10%)**

Summary of building codes that applies to:

A. Surveying

B. Architectural design and graphics standard

C. Natural and artificial ventilation

D. Hot / cold water supply

E. Drainage system, piping materials and size

F. Electrical standards

Deliverable 4: Final Report and Presentation (40%)

a. **Final Report – 20%**

- Using font size 12 Times New Roman, single space.
- APA Format, including all references/citations.
- Outlining diagrams assumptions, challenges, and special features in plumbing, electrical systems, architectural design, and construction.
- CAD diagrams for each feature within the building.
- Small scale model of structure – selected by the group.
- Conclusion.
- Relevant citation of sources and appendices.

b. **Presentation – 20%**

- **Final group presentation –** using PowerPoint focusing on major areas of the project and conclusion of the project. Based on creativity, clarity, details, use of language, use of time etc.

METHODS OF DELIVERY:

1. Demonstration
2. Presentation
3. Stimulation
4. Lab Work/ Practical
5. Research
6. Projects
7. Group work
8. Self-directed
9. Consultation

METHODS OF ASSESSMENT AND EVALUATION:

1. Coursework:
    a. In-class presentations 10%
    b. Individual Report 10%
2. Final Examination (Final project and presentation) 80%

RESOURCE MATERIALS:

Ching, D. K. F. (2008). *Building Construction Illustrated* (4th ed.). New Jersey, NJ: Wiley.

Feigenbaum, L. & Dagostino, R. F. (2002). *Estimating in Building Construction* (6th ed). New Jersey, NJ: Prentice Hall.

Frank, C. (2009). *Architectural Graphics* (5th ed.). New Jersey, NJ: Wiley.

Iano, J. & Allen, E. (2008). *Fundamentals of Building Construction: Materials and Methods* (5th ed.). New Jersey, NJ: Wiley.

Kavanaugh, B. F. (2008). *Surveying: Principles and Applications* (8thed.). New Jersey, NJ: Prentice Hall.

Meir, W. H. & Wyatt, J. D. (2007). *Construction Specifications: Principles and Applications*. Florence, KY: Delmar Cengage Learning.

Nathanson, A. J., Lanzafama, M. & Kissam, P. (2005). *Surveying Fundamentals and Practices* (5th ed.). New Jersey, NJ: Prentice Hall.

Pratt, D. (2010). *Fundamentals of Construction Estimating* (3rd ed.). Florence, KY: Delmar Cengage Learning.

THE COUNCIL OF COMMUNITY COLLEGES OF JAMAICA

COURSE NAME:	Construction Technology I
COURSE CODE:	CONS1201
CREDITS:	3
CONTACT HOURS:	75 hours (30 hours theory + 45 hours practical)
PRE-REQUISITE(S):	None
CO-REQUISITE(S):	None
SEMESTER:	II

COURSE DESCRIPTION:

This course is designed to give a good theoretical and level two practical background to what is essential to the formal construction development principles to the advanced principles applied in building activities. Students will cover the built environment, site works, subsoil drainage, excavations and timbering, foundations, concrete and construction materials, shoring, scaffolding, enclosures, and elements.

COURSE OUTCOMES:

Upon successful completion of this course, students should:

1. understand the general principles of construction and building technology.
2. construct structures employing suitable and sustainable environmental practices.
3. appreciate the theories, practices, and complex areas within the field of construction.
4. demonstrate various tasks that will assist or complete construction.

UNIT I – The Environment: Factors that affect the Erection of Buildings (5 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. explain what subsoil structure and its components are.
2. perform simple soil test.

3. examine how soil and subsoil factors affect the construction industry and new projects.
4. explain the extent to which government enforcement policy affects the construction industry.
5. Aanalyze how the construction planning procedures affect the construction industry and the environment.
6. identify the different members of the construction industry and create a flow chart diagram of the members.
7. identify the members of the building team and the duties they perform.
8. create a project management schedule from site clearance to finishing work on a small dwelling unit.
9. assess how the construction industry enhances the environment.

Content:

1. Subsoil: Types of subsoil, list subsoils.
2. Soil test: Planning procedures, borehole, field visit/history.
3. Climatic: Use of appropriate construction procedures ware content, temperature, rainfall, disaster conditions, and earthquake conditions.
4. Geographic – area – terrain and landform.
5. Sensory what will appease the client's nature to build on that soil/subsoil form/type, sight, smell, hot or cold, scenery, water or water cover, safety, feeling and productivity.
6. Government Planning Procedures: Legal development procedures, land title, zoning.
7. Change of use of land policy.
8. Construction Industry planning procedures draw a diagram of a site analysis (e.g. soil conditions, water runoff, traffic, tracks, roadways, buildings, sunlight and wind direction, plan approval, layout to fit the site, and how these factors above affect the environment.
9. The building team.
10. Simple Project Management techniques.
11. Environmental development by the construction industry – financially, create new and modern structures, beautification, protection against erosion of land and water bounded borders.

UNIT II – Site Works and Setting Out (15 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. explain what sight clearance in the construction sector is.
2. summarize the necessary checks that are made before a site is cleared and analyze the site clearance process.
3. demonstrate the setting out of a building on site, e.g. Rectangle with a semi-circle wall/shape.
4. appraise the process plan for the construction of a building; draw or sketch diagram(s) of the procedures involved in setting out a building.
5. explain the terms 'site datum' and 'site layout'.
6. draw and label diagram(s) of the procedures involved in establishing a site datum.
7. draw and label diagram of a site layout.
8. create a model site of a site layout.
9. research the methods of establishing each facility on site for accommodation.
10. show how storage facilities are sized/placed on site for access/use and accommodation.
11. show how health/food/welfare facilities are sized/placed on-site for access/use and accommodation.
12. show how office facilities are sized/placed on site for access/use and accommodation.
13. show basic health and safety policies for a construction site.
14. justify the hoarding process in the provision of security for a construction site.
15. explain how health and safety helps in providing security at a construction site.
16. assess the benefits that goods and service providers afford a construction site.

Content

1. Site clearance.
2. Setting out the building.
3. Establishing a datum.
4. Site Layout.
5. Purposes of storage facilities.
6. Health and safety of workers and property, e.g. PPE, FDNS and site area.
7. Accommodation.
8. Security.
9. Services and goods (merchandize) providers.

UNIT III – Subsoil Drainage (5 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. explain the use of domestic drainage/surface water or storm water drainage in construction.
2. explain the following terms: ‘drain’, ‘gully’, ‘invert level’, ‘manhole’, ‘public sewer’, ‘soil drainage’, ‘soil vent pipe’, ‘trap’, ‘surface water drainage’, ‘effluent’, ‘sewage’ and ‘run’.
3. calculate the depth of a suitable drain at the side of the house and at the end of the drain run.
4. choose a suitable gradient based on pipe size and length of drain run.
5. calculate the invert level for a drain run.
6. differentiate the types of drainpipes.
7. explain four (4) methods of joining drainpipes.
8. evaluate three (3) drain testing methods.
9. analyze the drain checking process used to ensure water tightness.
10. draw and label an overview of above ground drainage for a house.
11. how to layout a drainpipe – below and above ground.

Content:

1. Stormwater or surface water drainage process and layout.
2. Below and above ground drainage process and layout.
3. Domestic drainage process and layout.
4. Types of pipe materials.
5. Pipe joining methods.
6. Drain testing methods.
7. Diagrams of a domestic drainage system and pipe field.
8. Diagram of a manhole.
9. Difference between above-ground and subsoil drainages.

UNIT IV – Excavation and Timbering (10 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. explain the term ‘excavation’ as it relates to constructing a building.
2. differentiate between excavating topsoil and excavating subsoil.
3. explain the terms ‘timbering’, ‘walings’, ‘struts’, ‘polings’, ‘wedges’.
4. critique three (3) timbering methods.
5. draw diagrams of timbering for different soil types.
6. examine five (5) mechanical plants.
7. describe the manual tools for excavation.
8. explain the following terms: ‘removing the topsoil’, ‘reducing levels’, ‘digging trenches for strip FDNS’, ‘digging pits for columns and piers’, ‘digging holes for piles’, ‘digging sloping sides’, ‘digging step FDNS’, ‘digging out basements’.
9. assess the need for supports in the excavation process.
10. analyze the factors that need to be considered when performing excavation.
11. describe health and safety principles or building standards that would contribute to safety in excavation.
12. construct steelwork for foundations – matting, wall bar, column, and stiffener.

Content:

1. Excavation principles for building foundations.
2. Timbering for building construction in different soil types.
3. Occupational Safety & Health (OSH) while constructing excavation.
4. Mechanical plants.
5. Factors for consideration when performing excavation work.
6. Health and safety principles/building standards used in excavation.

UNIT V – Foundations (5 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. explain the purpose of a foundation.
2. differentiate between the natural and artificial foundations.
3. explain what is a strip (raft, pad, piled) foundation.

4. draw and label diagrams to represent a (strip deep strip, step, raft, pad, piled) foundations.
5. outline three (3) types of foundation loads.
6. summarize four (4) conditions that affect foundations.
7. explain the method of overlapping a step foundation.
8. calculate the size of a strip or pad foundation.
9. assess the advantages and disadvantages associated with any two foundation types.
10. demonstrates the building of a foundation.

Content:

1. The natural foundation.
2. The artificial foundation.
3. Foundation loads.
4. Diagrams of foundations for strip/deep strip, step, raft, pad, piled.
5. Conditions that affect foundations.
6. Method of overlapping a step foundation.
7. Calculation of the size of strip or pad foundation.
8. Advantages and disadvantages of different types of foundations.
9. Build a foundation – practical Construct model foundation, e.g. strip, pad.

UNIT VI – Concrete and Construction Materials (10 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. explain the terms ‘formwork’, ‘concrete’, ‘batching of concrete’, and ‘mixing of concrete’.
2. describe the different formwork arrangements.
3. make sketches, label, and construct three (3) formwork arrangements.
4. design formwork for irregular shaped concrete members.
5. lay blocks to industry standards.
6. create a formwork for any of the following: columns, beams, and arches.
7. demonstrate batching and mixing of concrete in construction.
8. demonstrate the mixing of concrete for a project in your practical work.
9. explain the process of curing of concrete.
10. classify the different types of cement, making reference to the properties and manufacturing process.
11. demonstrate how to build a block wall.

Content:

1. Explanation of terms – 'formwork', 'concrete', 'batching of concrete' etc.
2. Ingredients: cement/sand/stone/water.
3. Concrete – Batching, Mixing, Placing, Curing.
4. Diagrams of formwork arrangements.
5. Formwork for irregular-shaped concrete.
6. Formwork for columns, beams, and arches.
7. Concrete mixing demonstration.
8. Classifications of cement.
9. Block laying.

UNIT VII – Shoring and Scaffolding (5 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. explain the term 'shoring'.
2. differentiate the types of shoring systems.
3. make sketches of established shoring systems.
4. use the principles of shoring to design unique support systems.
5. explain the term 'scaffolding' referring to different types of scaffolding systems.
6. observe the principles involved in the construction and erection of scaffolding systems.
7. make sketches of putlog scaffold and identify the various parts.
8. make sketches of an independent scaffolding system and identify the various parts.
9. differentiate between a putlog scaffold and an independent scaffold.
10. determine the health and safety procedures for the use of ladders on a scaffolding.
11. demonstrate safety standards based on construction principle for erection and use of scaffolding.
12. describe two safety regulations for the safe erection of scaffolding materials and scaffolding.
13. differentiate between timber and metal scaffolding.
14. research the different forms of scaffolding.

Content:

1. Shoring.
2. Shoring systems.
3. Scaffolding.

4. Visit construction site to see how scaffolding is supported and used.
5. Differences between independent and putlog scaffoldings and timber and metal scaffolding.
6. Safety procedures used in scaffolding.
7. Research on different types of scaffolding.

UNIT VIII – Enclosure (15 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. explain the following terms: ‘floors’, ‘walls’, ‘roof’, ‘arches’, ‘opening in walls’.
2. distinguish among the following types: floors, walls, roof, arches, and openings in walls.
3. list different kinds of finishing materials for the following: floors, walls and infill walls, roof, arches and openings in walls.
4. explain the construction process for the following: floors, walls, roof, arches, and openings in walls.
5. create a model presentation of the following: floors, walls, roof, arches, and openings in walls.
6. outline different kinds of building materials for the following: floors, walls, roof, arches and openings in walls.
7. differentiate between external and internal walls making particular reference to load bearing and non-load bearing types and their characteristics.
8. explain the nature of the following: natural stone, brick and cement-based blocks, mortar, brick bonding, brick dimensioning and block dimensioning.
9. build a block wall and jointed wall.
10. draw and label diagrams of brick and block bonding in masonry works.
11. explain the terms DCP and DPM.
12. explain how DCP and DPM each will overlap in masonry works with the use of a diagram as support.
13. describe what is a lintel.
14. explain what openings in brick walls are.
15. justify the use of lintels and arches in construction.
16. explain with the use of diagrams the process of arch centering.
17. explain the following: pier, column, and beam construction.
18. explain different styles of walls: stone, cavity, rubble, block, and brick.
19. draw a diagram of a roof frame giving description of the different parts.
20. draw and label an eave detail.
21. differentiate between different types of roof construction.

Content:

1. Floor types and construction.
2. Walls types and construction.
3. Roof types and construction.
4. Arch types and construction.
5. Openings in walls.
6. Lintel and construction.
7. DCP and DPM in construction.
8. Diagram for an eave detail.
9. Different types of roof construction.

UNIT IX – Construction Elements (5 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. differentiate between joints and junctions in carpentry works.
2. explain the purpose of joints in masonry, wood, and metal works.
3. identify truss connectors for roof fixing.
4. explain the nature of roofing parts connectors.
5. explain what tiling battens are.
6. explain why finishing materials have interlocking ends/capillary grooves/sheet overlaps.
7. explain ironmongery, making reference to at least five (5) types.
8. outline the purpose of doors/windows in construction.
9. describe five (5) types of doors/windows/roof finishes.
10. differentiate between a wood joint and a metal joint.
11. explain the purpose of a hinge joint.

Content:

1. Theory of elements.
2. Types of elements.
3. Construction element.
4. Junctions and joints:
    a. Windows
    b. Differences
    c. Roofing finishes

d. Doors
e. Internal fixing
f. Ironmongery

5. Ironmongery and types of ironmongery.
6. Differences between wood and metal joints.
7. Hinge joint purposes.
8. Tiling battens.

METHODS OF DELIVERY:

1. Lectures
2. Worksheets
3. Audio and tape evaluations
4. Demonstration
5. Peer conferencing
6. Presentation(s)
7. Research
8. Observation
9. Project
10. Field Trip

METHODS OF ASSESSMENT AND EVALUATION: Continuous assessments

1. Coursework	:	**50%**
a. Practical Project	15%	
b. Presentations	15%	
c. Mid Term Test	20%	
2. Final Examination (Practical Examination)		**50%**

RESOURCE MATERIAL:

Prescribed:

Ching. D. K. F. (2008). *Building Construction Illustrated.* (4th ed.). New Jersey, NJ: Wiley.

Chudley, R. & Greeno, R. (2005). *Construction Technology*. (4th ed.). Essex, UK: Addison Wesley Longman.

Meir, W. H. & Wyatt, J. D. (2007). *Construction Specifications: Principles and Applications*. Florence, KY: Delmar Cengage Learning.

Online Resources:

Ebscohost database- https://www.ebscohost.com/

Springer E-Books- http://link.springer.com/

THE COUNCIL OF COMMUNITY COLLEGES OF JAMAICA

COURSE NAME:	General Technology
COURSE CODE:	GTEC1101
CREDITS:	3
CONTACT HOURS:	75 (30 hours theory, 45 hours practical)
PRE-REQUISITE(S):	
CO-REQUISITE(S):	None
SEMESTER:	I

COURSE DESCRIPTION:

The built environment infuses various areas of technical activities, apart from general construction activities, which exposes personnel to electrical and mechanical hazards. Consequently, students operating in the technical or industrial environment need to be aware of the potential hazards that exposure to electrical and mechanical tools and equipment may pose. To combat these hazards, students need to have sufficient knowledge of general safety, safety regulations, and safety and maintenance concerns relating to the use of electrical power tools and machines. The course focuses on electrical principles, the use of hand and machine tools and the underpinning of occupational health and safety that accompanies such activities.

COURSE OUTCOMES

Upon successful completion of this course, students should:

1. demonstrate safety, health, and welfare principles in relation to the built environment.
2. appreciate the constraints that electrical and mechanical systems impose on safety in the work environment.
3. use common tools safely in performing construction operations.
4. understand the principles of building maintenance and sustainability and its impact on the life of the build and the environment.

UNIT I – Safety, Health, and Welfare (15 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. dress appropriately for technically related tasks.
2. describe a safe and healthy work environment.
3. examine first aid precautionary methods for common injuries occurring in industrial environment.
4. research legislation governing safety regulations in the built environment.

Content:

1. List common personal protective equipment (PPE) (hand, head, feet, eyes, and body).
2. Advantages and disadvantages of wearing specific PPEs when utilizing tools and equipment.
3. How to wear PPEs correctly.
4. Care of PPEs.
   a. Use of safety signs.
   b. Housekeeping.
   c. Safe workspace related to lighting, heat and ventilation.
   d. Explain first aid concepts and principles.
   e. Common injuries for first aid treatment to include: cuts, bruises, burns, shock, fracture, eyes injuries, and fumes.
   f. Items in a first aid kit.
   g. Review OHS acts.
   h. Review the Jamaican Factories Act.
   i. Examine safety policies.
   j. Appropriate use of common safety forms, e.g., Accident Report form.
5. Safety legislation in the built environment – OHSA Act and others.
6. Handle hazardous materials.

UNIT II – Fire Prevention (15 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. define ‘fire’.
2. discuss the nature of fire (fire triangle).
3. define a ‘fire load’.
4. discuss fire loads: low, moderate, and high.
5. discuss the methods used in the protection of structural members.
6. discuss fire-fighting methods used in buildings and planning escape routes.
7. explain the term fire resistance.
8. draw diagrams to show escape routes from various buildings.
9. discuss fire stopping in terms of doors and walls.
10. explain the purpose of a fire escape route.
11. plan a fire escape route.

Content:

1. Fire
2. Fire classification
3. Fire triangle
4. Fire resistance
5. Fire protection of structural members
6. Fire test grading
7. Fire stopping
8. Fire spread
9. Fire load
10. Means of fire escape in case of a fire
11. Planning the escape route/s
12. Fire precautions
13. Means of escape from fire in a small dwelling or small hotel (Stage 1 or 2)
14. Means of escape from fire in an office building
15. Fire Extinguisher and their uses

UNIT III – Construction Hand and Measuring Tools (15 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. use hand tools in construction settings - clean and store properly.
2. make simple joints, e.g., Mortise and Tenon, Butt, Dovetail etc.
3. use a tape measure, level, compass, square, plumb bob, and clamps.
4. convert between Metric and Imperial measurement.
5. Demonstrate Care and safety of hand tools.
6. Use Marking-out and measuring tools.

Content:

1. Categories of hand tools:
   a. Cutting tools
   a. Marking out tools
   b. Layout tools
   c. Clamps
   d. Measuring tools
   e. Making of timber joints –e.g., Mortise, Tenon, Butt, Dovetails
2. Types of joints (wood, metal, and concrete).
3. Cleaning and storage of hand, marking-out and measuring tools.
4. Demonstrate the accurate use of marking and measuring tools for construction purposes.

UNIT IV – Construction Machine Tools Wood Working Machine (15 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to

1. explain the functions of the named machine tools (table saw, band saw, thicknesser, jointer, radial, and drill press).
2. demonstrate how to use the named machine tools.
3. discuss the nature of cutting tools.
4. state the safety precautions for the use of each machine and demonstrate the use of each machine.

Content:

1. Parts, functions, and operations for table saw, lathe, planer, and router.
2. Cutting tools, e.g., saw, chisel.
4. Machine tool safety.
5. Importance of machine guards.

UNIT V – Maintenance (12 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. define ‘building maintenance’.
2. examine the types of maintenance strategies for buildings.
3. select an appropriate type of maintenance strategy for a given situation.
2. demonstrate proper preventative maintenance techniques for different types of facilities.
3. prepare a complete maintenance schedule for the building.

Content:

1. Classify maintenance strategies.
2. Compare/contrast maintenance strategies (corrective, breakdown, predictive, proactive, preventive).
3. Maintenance schedule.

METHODS OF DELIVERY:

1. Lectures
2. Worksheets
3. Audio and tape evaluations
4. Discussions
5. Peer conferencing
6. Presentation(s)
7. Research
8. Field Trips
9. Quizzes

METHODS OF ASSESSMENT AND EVALUATION:

1. Common Coursework 30 %
2. Internal assignments 20%
3. Final Examination 50%

RESOURCE MATERIAL:

Prescribed:

Macmillian Series Building Construction Principles and Practices Motivate Series.

Macmillian Series Dalton Walton Woodwork Technology Motivate Series.

Recommended:

Herman, L. S. (2002). *Residential Construction Academy: Electrical Principles*. Florence, KY: Delmar Cengage Learning.

Iano, J. & Allen, E. (2008). *Fundamentals of Building Construction: Materials and Methods* (5th ed.). New Jersey, NJ: Wiley.

Wilkinson, P. (2005). *Construction Collaboration Technologies*: *An Extranet Evolution*. Fetter Lane, London: Spon Press.

Online Resources:

Ebscohost database- https://www.ebscohost.com/

Springer E-Books- http://link.springer.com/

THE COUNCIL OF COMMUNITY COLLEGES OF JAMAICA

COURSE NAME:	History of Architecture
COURSE CODE:	ARCH2302
CREDITS:	3
CONTACT HOURS:	45 (45 hours theory)
PRE-REQUISITE(S):	
CO-REQUISITE(S):	None
SEMESTER:	

COURSE DESCRIPTION:

The course will introduce students to the basic concepts of the evolution of western Architecture from prehistoric to current Caribbean trends. The course is divided into three (3) sections:

1. Introduction to some theories, tools, influencers, and the profession.
2. Prehistoric to Modernism.
3. Modernism to Post Modern Caribbean.

COURSE OUTCOMES:

Upon successful completion of this unit, students should:

1. demonstrate a fair grasp of the historical factors affecting the profession and the architect who influenced it.
2. understand the use of historical analytical tools (the timeline).
3. understand the application of the analytical tools to historical periods.
4. identify the main stylistic and visual icons of each period.
5. understand the forces affecting architecture in each period.
6. appreciate the relative differences between all the various forms of architecture.

UNIT I – Defining Architecture (7 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. define ‘architecture’.
2. explain the history of architecture as a name.
3. draw an architectural structure that is pre-historic (cave dwellings, stone henge etc.).
4. list historical authors of architecture - Vitruvius 15 BC, Le Corbusier 1887-1965/ Bauhaus, John Ruskin 1819-1900, Andrea Palladio 1508-1580.
5. name and discuss historical architects, e.g., Barbori and ancient Greek architects.
6. explain why Roman architecture is considered to be stolen from the Greeks.

Content:

1. The history of the profession.
2. Analytical modelling of history (Greek versus Roman architects).

UNIT II – Tropical Architecture (3 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. assess designs to match tropical regions.
2. evaluate how particular elements have evolved with technological advancements.

Content:

1. Verandah, hurricane shutters, awnings.
2. Temperature control, lighting, and ventilation.

UNIT III – The Early Evolution of Architecture (20 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. discuss the development of architecture throughout these specified periods.

a. The Neolithic Period
b. Early Classicism
c. Hellenistic Classicism
d. Late Classicism
e. Gothic style and its evolution, Neo-Gothic styles and explain the leadership that prospered Gothic Style
f. draw a design to mimic the gothic looks in architecture (the Cathedral front or Isometric view)
g. A brief introduction to the Middle Ages: Baroque, Neoclassic.
h. The Industrial Revolution and the emergence of Modernism.
    i. Discuss the Industrial revolution period.
    ii. discuss the role the French played in the development of architecture.

2. draw a diagram of these styles.
    a. Doric
    b. Ionic
    c. Corinthian
    d. Create a scrapbook with coloured pictures of these buildings in the timelines being studied (all pictures should be dated, named, timelined, and professional architect/s responsible for the job listed). Work can be presented electronically.
3. trace the timelines from pre-historic architecture to post-modern.
4. explain timelines with reference to the period of development.
5. crucially analyze the architectural features of each type of architecture in its timeline.
6. explain why timelines overlap.
7. discuss the analytical modelling of architecture throughout history.

Content:

1. The Neolithic Period
2. Early Classicism
3. Hellenistic Classicism
4. Late Classicism
5. Gothic style and its evolution
6. (Brief introduction to the Middle Ages: Baroque, Neoclassic & Neo Gothic styles).
7. The Industrial Revolution and the emergence of Modernism

UNIT IV– 1900's Modern Architecture to Contemporary Caribbean Residential and Commercial Styles (12 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. describe 'modern architecture'.
2. explain what brought about rapid technological changes in architecture during the modern phase of architecture.
3. examine the rapid changes in building forms.
4. describe Postmodern architecture.
5. compare and contrast urban designs with old designs.
6. examine the development of the professional architect.
7. compare modern architecture with Postmodern architecture.
8. discuss Modernism.
9. explain how tectonics relates to the changes in architectural designs.
10. discuss the influencers of Caribbean architecture.
11. discuss specific and distinct features of the Caribbean.
12. discuss contemporary Caribbean Architecture as it relates to styles seen around today.
13. research Postmodern architecture and create documentation as a scrapbook or electronic data.
14. tour areas within the country and view and compare modern, postmodern, and very old structures.
15. research the world's two tallest buildings, say why one is taller and give professional details of the buildings.
16. compare the tumbling of the early mills with the late empire state building with specific reference to steel properties and usage.
17. list professional architects and match the listings to a timeline.

Content:

1. Rapid technological changes in urban and building forms.
2. The rise of the professional Architect.
3. Modernism.
4. Postmodernism.
5. Reading Caribbean Architecture:
   a. Historic
   b. Commercial

c. Political
d. Social and
e. Technological influences upon the styles of architecture of the Caribbean.

6. Eclecticism and Icons of styles.

METHODS OF DELIVERY:

1. Lectures
2. Audio and tape evaluations
3. Discussions
4. Presentation(s)
5. Research
6. Case Studies

METHODS OF ASSESSMENT AND EVALUATION:

1. Coursework 30%
2. Final Examination 40%
3. Course project: 30%
   Students should create a model of a building from one of the timelines analyzing each component of the building.

RESOURCE MATERIAL:

Prescribed:

Ching, D. K. F., Jarzombek, M. M., & Prakash, V. (2006). *A Global History of Architecture*.

New Jersey, NJ: Wiley.

Recommended:

Borden, D., Elzanowski, J., Taylor, J., & Turek, S. (2008). *Architecture: A World History*.

Abrams.

Sullivan, C., & Boults, E. (2010). *Illustrated History of Landscape Design***.**

New Jersey, NJ: Wiley.

Online Resources:

Ebscohost database- https://www.ebscohost.com/

Springer E-Books- http://link.springer.com/

THE COUNCIL OF COMMUNITY COLLEGES OF JAMAICA

COURSE NAME:	Introduction to CAD (Computer Aided Drawing)
COURSE CODE:	ACAD1201
CREDITS:	2
CONTACT HOURS:	90 hours lab (suggested two 3 hours lab sessions)
PRE-REQUISITE(S):	None
CO-REQUISITE(S):	None
SEMESTER:	II

COURSE DESCRIPTION:

This course is designed to provide students with a basic knowledge of Computer Aided Drawing and Design. This should include 2-dimensional and 3-dimensional aspects of drawing. It will also equip students with the practical knowledge of designing and producing drawings in parts and as a complete structure. Additionally, the course will prepare students for advanced studies/fields of work in Architecture, Engineering, and Construction.

COURSE OUTCOMES:

Upon successful completion of this unit, students should:

1. gain literacy and understanding of the role of computerized equipment in drafting/design.
2. functions of our industrial society.
3. develop a familiarity with the concepts, equipment, procedures, and practices of CAD.
4. develop an initial skill in the use of a microcomputer-based CAD system to perform graphics functions.
5. develop basic auto-graphic skills.

UNIT I – Introduction to C.A.D. (9 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. identify different CAD programmes.
2. evaluate different types of CAD programmes.

Content:

1. Introduction to CAD programmes.
2. Understanding the display of CAD programmes.
3. Compare different CAD programmes.

UNIT II – Creating Your First Drawing (18 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. open a new drawing.
2. select the appropriate template.
3. operate menu options.

Content:

1. Start a CAD programme.
2. Set scale and units.
3. Draw lines and basic shapes.

UNIT III – Understanding Coordinates (9 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. set drawing limits.
2. set starting point.
3. draw lines using coordinate systems.

Content:

1. Workspace.
2. Types of Coordinates systems.

UNIT IV – Creating Basic Geometry (12 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. draw regular and irregular polygons.
2. draw geometric shapes.

Content:

1. Creating Basic Geometry.
2. Drawing Rectangles (RECTANG).
3. Drawing Circles (CIRCLE).
4. Drawing Arcs (ARC).
5. Drawing Polygons (POLYGON).

UNIT V – Basic Editing Skills (6 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. modify drawing.
2. use selection set to modify various objects.
3. select objects.

Content:

1. Basic Editing Skills.
2. Using the Editing Commands.
3. Deleting Objects (ERASE).
4. Restoring Accidentally Erased Objects (OOPS).
5. Moving, Copying, and Stretching Objects.
6. Rotating, Mirroring, Scaling, and Offsetting Copying Objects.
7. Editing Edges and Corners of Objects.
8. Undoing Your Work (UNDO, REDO).

9. Removing Unwanted Objects (PURGE).
10. Using MULTILINE (MLINE).
11. Editing with Grips.
12. Setting Grips Options.
13. Using the Grips Auto edit Modes.

UNIT VI – Dimensioning Drawing (6 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. distinguish between various types of dimensioning.
2. do basic dimensioning.
3. edit dimensions styles.
4. prepare dimensions with different formats.

Content:

1. Dimensioning a Drawing.
2. Dimensioning with Precision.
3. Creating Dimension Styles.
4. Linear Dimensioning.
5. Radial Dimensioning.
6. Angular Dimensioning.
7. Ordinate Dimensioning.
8. Editing Dimensions styles.
9. Additional Dimensioning Feature.
10. Adding Text to a Drawing.
11. Spell-Checking a Drawing (SPELL).
12. Using the Multiline Text Editor (MEDIT).

UNIT VII – Viewing Drawing (6 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. display drawings.
2. distinguish between a 2-d and a 3-d virtual screen.
3. use the virtual screen.
4. select the zoom tool.

5. select and zoom object.
6. pan and move object.
7. create views using the area view window/Mslide/Vslide.
8. create a slide library.
9. state what is a slide library.

Content:

1. Viewing a Drawing.
2. Understanding the Display.
3. Understanding the Virtual Screen.
4. Using ZOOM To Control the Display (ZOOM).
5. Panning the Display (PAN).
6. Creating Views (VIEW and DDVIEW).
7. Using the Aerial View Window.
8. Creating and Viewing Slides (MSLIDE, VSLIDE).
9. Creating Slide Libraries (SLIDELIB).

UNIT VIII – Plotting Drawing (6 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. select plot.
2. configure the plotter.
3. plot to PDF/save.
4. plot to print/save.
5. plot and send to email.
6. plot and publish.
7. scale plot diagrams.
8. cut and paste plot diagrams.

Content:

1. Plotting a drawing.
2. Configuring drawing for plotting.
3. Configuring for printing.
4. Plotting considerations.

UNIT IX – Advanced Drawing Techniques (18 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to use CAD commands to:

1. divide an object.
2. select a hatch style for a drawing within boundaries.
3. assess hatching problems.
4. draw site plan.
5. draw elevations.
6. draw floor plans.
7. select architectural features.
8. determine areas of various figures.
9. create worksheet.

Content:

1. Advanced Drawing Techniques.
2. Indicating Locations (POINT).
3. Dividing an Object (DIVIDE).
4. Finding Area.
5. Filling Areas with Hatching.
6. Boundary Hatch (BHATCH).
7. Understanding Common Hatching Problems.
8. Architectural Features.

METHODS OF DELIVERY:

1. Lectures
2. Demonstrations
3. Reading assignments
4. Labs
5. Audio-visual resources (films, tapes)

METHODS OF ASSESSMENT AND EVALUATION:

The three projects will be completed in addition to smaller homework assignments. There will be a working drawing of a mechanical assembly, an architectural plan, and a project of your choice. Suggested for the course is the latest AutoCAD (available/cost) software.

Evaluation and Assessment (Practical)	100% Course work
1. Coursework/ Projects	70%
Geometry (**shapes, isometric drawing**)	20%
Architectural (**floor plans, site plans and elevations**)	30%
3D Drawing	20%
2. **Major project**	30%

RESOURCE MATERIAL:

Recommended:

Aubin, F. P. (2009). *Mastering AutoCAD Architecture 2010* (7th ed.). Autodesk Press.

Palma, M. R. & Maden, A. D. (2004). *Architectural Drafting Using AutoCAD: Drafting,*

Design. Goodheart-Wilcox.

Required: AutoCAD (latest) software for this course.

Websites:

Ebscohost database- https://www.ebscohost.com/

Springer E-Books- http://link.springer.com/

THE COUNCIL OF COMMUNITY COLLEGES OF JAMAICA

COURSE NAME:	Land Surveying I
COURSE CODE:	BLDG1203
CREDITS:	2
CONTACT HOURS:	90 (45 hours theory, 45 hours practical)
PRE-REQUISITE(S):	None
CO-REQUISITE(S):	None
SEMESTER:	II

COURSE DESCRIPTION:

This course is structured to give students a basic, practical knowledge of the fundamental principles and applications of Land Surveying. Students will gain knowledge and skills by being involved in actual fieldwork. More specifically, the course will look at the nature of surveying, distance measuring and chain surveying, levelling, map work and real estate.

COURSE OUTCOMES:

Upon successful completion of this course, students should:

1. know what surveying is and how surveying is done scientifically based upon historical and modern developments.
2. understand the correct use of various tools used in processing measurements for survey documents.
3. know how chain surveying and leveling is done instrumentally and from mathematical formulas.
4. appreciate surveying as an instrument used to develop coordinates and positioning of real estate globally.
5. develop an understanding of graphical and mathematical calculations as they relate to precise measurements needed for survey records.

UNIT I – The Nature of Surveying (20 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. define ‘surveying’.
2. list types of surveying (plane, geodetic, preliminary).
3. explain the two (2) types of surveying.
4. list classes of surveys (control, preliminary).
5. explain classes of surveys.
6. explain the various applications of surveys.
7. explain the historical background of surveying (compare methods earlier with modern methods.
8. list the principles of surveying.
9. describe the various principles of surveying.
10. differentiate between the branches of surveying.
11. establish field notes and data and list rules for establishing such data.
12. identify historical surveying tools.
13. demonstrate the principles of surveying in actual fieldwork, including initial site visits.
14. establish preliminary planning of survey exercises.
15. establish boundaries, corners, and tie marks.
16. prepare for a reconnaissance survey.
17. prepare the data collection book for surveying exercise.
18. establish field notes and data.
19. list rules for establishing such data in the field.
20. list and explain the nature of geomatic instruments.
21. explain the nature of geomatic instruments.
22. explain the terms under survey references such as grid reference, legal reference, vertical reference, geographic reference, accuracy and precision, location methods, unit of measure, accuracy ratio and distance measurement.

Content:

1. Branches of Surveying
2. Principles of Surveying
3. References

UNIT II – Distance Measuring and Chain Surveying (10 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. identify the equipment used in chain surveying.
2. list distance measuring tools.
3. list tools that can measure distance and angles, including GPS technology.
4. list tools that measure angles only.
5. explain tapes and chains.
6. distinguish between chains and tapes.
7. identify types of material used in production of tapes and chains.
8. state the characteristics of tapes and chains.
9. inspect ways that tapes are marked or graduated.
10. explain how to use tapes and chain surveying equipment.
11. demonstrate how chain surveying is carried out.
12. set out or set up measuring instruments over stations (plumbed with optical squares or plumb bob).
13. locate stations or targets properly.
14. demonstrate how to measure distances precisely.
15. define and compare 'surveying error'.
16. explain how to "book information" for chain surveying fieldwork and how to use bounded and unbounded books or instrument databases.

Content:

1. Chain Surveying: Equipment.
2. Theory of Errors, including GPS.
3. Preparing the Report.

UNIT III – Leveling (15 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. define ‘levelling’.
2. distinguish between a level and the theodolite and total station.
3. state what is a level.
4. list the components of a level, including the dumpy level, tilting level, and automatic level.
5. list the different parts of a tripod (differentiate between a tribrach and tripod).
6. demonstrate the use of surveyors’ levels.
7. demonstrate the use of a tripod.
8. demonstrate the use of a staff.
9. demonstrate how a levelling survey is carried out, including reading various types of “staff” markings.
10. explain how to “book information” for levelling fieldwork.
11. create a field book with notes from school surveying activities.
12. calculate the absolute values of a levelling exercise.

Content:

1. Levelling: Components of a Level, Types of Levels
2. The Tripod
3. The Staff
4. Preparing the Report

UNIT IV – Maps (10 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. explain the importance of the use of maps in surveying.
2. list types of maps.
3. identify the different symbols used on a map.
4. demonstrate how to use colours and patterns to beautify a map.
5. use the map scale to note distances on land.

6. use map symbols to detect features on the land.
7. design a table of map symbols.
8. distinguish between the advantages and disadvantages of map production.
9. state the advantages and disadvantages of using the following map production: ink drawing, hand lettering and stencils.
10. discuss photogrammetry.
11. explain the camera system used in aerial photography.
12. distinguish between flight lines and overlaps in photogrammetry.
13. calculate scale ratio (SR), flying heights (H), focal length (*f*), and photo scale.
14. explain the photographic scale with the use of a diagram.
15. explain with the aid of a diagram the relationship between ground datum and flying height.
16. list aerial advantages and disadvantages.
17. explain three things that aerial photography could help to interpret within zones.
18. explain the use of maps/plans.
19. research map symbols and plan symbols.
20. draw a profile of a simple contour plan with its elevations on both the end (sectional) and plan view.
21. describe aerial survey.
22. describe the GPS.
23. explain GPS augmentation.

Content:

1. Map Production
2. Map Symbols
3. Advantages and Disadvantages of Map Production
4. Photogrammetry
5. The GPS

UNIT V – Traversing I (13 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. state what is a ‘traverse’.
2. explain types of traverses.
3. define the following: bearings, azimuth, horizontal angle, and vertical angle.

4. sketch diagram to show reverse bearings.
5. establish a right angle using a double right-angle prism (optical square).
6. layout corners using a double right-angle prism (optical square).
   establish north using a compass.
7. distinguish bearings and back bearings.
8. explain the differences between bearings and azimuth.
9. define given bearing data and calculate azimuth data with the use of a sketch.
10. explain the term ‘deflection angles’.
11. justify an azimuth computation from the southeast quadrant with the use of a diagram (or any other quadrant).
12. apply calculations for bearing and azimuth checks in case scenarios with presented information or using the textbook in a clockwise and anticlockwise direction.
13. do a bearing computation for a closed traverse/open traverse.
14. explain how lines are represented within a reference system to create latitudes and departures.

Content:

1. Bearings/back bearings
2. Relationship between bearings and azimuth
3. Azimuth
4. Horizontal angles
5. Vertical angles
6. Right angles
7. Magnetic direction (compass)
8. 4 figure grid reference and quadrants
9. 4 figure grid reference and quadrants positive and negative values
10. Deflection angles
11. Bearings and azimuth checks (clockwise and anticlockwise staging)
12. Latitudes and departures

UNIT VI – Constructional Volumes and Areas Computations (10 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. differentiate between ‘cross section’ and ‘profile’.
2. design a simple sketch of a cross-sectional arrangement for a cut and fill section for a road showing the proposed road.
3. calculate volume using the prismoidal formula/end areas.

4. calculate areas trapezoidal technique/Simpson's one-third rule.
5. sketch a topographical area for a section to be filled for road construction.

Content:

1. Profile
2. Cross section
3. End areas
4. Construction volumes

UNIT VII – Real Estate (9 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. define the following: 'personal property', 'real property', 'title', 'possession', 'adverse possession'.
2. distinguish between 'ownership' and 'possession'.
3. distinguish between various types of titles.
4. list the different owner rights – building rights, navigation rights etc.
5. define the term 'easement'.
6. explain the essentials of an easement.
7. justify the process of creating an easement.
8. apply land law in case scenarios.

Content:

1. Property: types of property (real/personal), ownership of property, owner's rights to property, titles.
2. Easement: essentials of an easement, creating an easement.

METHODS OF DELIVERY:

1. Lectures
2. Demonstrations
3. Field Experience

METHODS OF ASSESSMENT AND EVALUATION:

1. Common Coursework	20%
2. College Coursework	40%
3. Final Examination	40%

RESOURCE MATERIAL:

Recommended:

Gibson, R. (2009). *The Theory and Practice of Surveying: Containing All the Instructions Requisite for the Skillful Practice of This Art*. University of Michigan Library.

Kavanaugh, B. F. (2008). *Surveying: Principles and Applications* (8th ed.). New Jersey, NJ: Prentice Hall.

Nathanson, A. J., Lanzafama, M. & Kissam, P. (2005). *Surveying Fundamentals and Practices* (5th ed.). New Jersey, NJ: Prentice Hall.

Online Resources:

Ebscohost database- https://www.ebscohost.com/

Springer E-Books- http://link.springer.com/

THE COUNCIL OF COMMUNITY COLLEGES OF JAMAICA

COURSE NAME:	Land Surveying II
COURSE CODE:	BLDG2303
CREDITS:	2
CONTACT HOURS:	90 (90 hours practical)
PRE-REQUISITE(S):	Land Surveying I – BLDG1203
CO-REQUISITE(S):	Technical Math Skills
SEMESTER:	II

COURSE DESCRIPTION:

This course is structured to give students a basic, practical knowledge of the in-depth principles and applications of Land Surveying. Students will gain knowledge and skills by being involved in actual fieldwork. More specifically, the course will look at the nature of surveying, horizontal distance measuring, angular measurements and levelling as it relates to the construction industry, engineering data, ordnance, and global positioning.

COURSE OBJECTIVES:

Upon successful completion of this course, students should:

1. understand the theory and practice of measuring, recording, assessing, and presenting physical configuration.
2. appreciate the relationship between measured values and calculated values and the degrees of accuracy, which are possible and desirable.
3. appreciate the application of final data to construction of buildings, roads and road alignments, travel, maps building, coordination of global positions and areas, and angular as well as distance measurements.

UNIT I – Traversing II (30 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. outline the proper way to transport and care for geomatic surveying instruments.
2. demonstrate how to mount an instrument correctly on a tripod.
3. demonstrate how to optically adjust the surveying instrument for use in the field
4. define a ‘level line’.
5. define a ‘horizontal line’.
6. differentiate between ‘horizontal’ and ‘level’ lines.
7. detect when thermal expansion and heat effect are affecting the instrument.
8. explain the nature and behaviour of electromagnetic waves.
9. explain the effect of the earth’s curvature and refraction upon surveying observations.
10. research the GPS technology.
11. list GPS errors.
12. explain the nature of GPS errors.

Content:

1. Show how to transport and care for geomatic surveying instruments.
2. Proper mounting of Theodolite on a tripod.
3. Adjustment for Parallax in the field.
4. Identify a level line.
5. Identify a horizontal line.
6. Illustrate using a diagram to show the relationship between horizontal and level lines.
7. Outline the effect of thermal expansion and heat on instruments.
8. Explain the nature and behaviour of electromagnetic waves.
9. What are electromagnetic waves.
10. What is frequency.
11. What is velocity.
12. With the aid of diagrams, describe the effect of the earth's curvature and refraction upon surveying observations.
13. Produce research on GPS technology.
14. Effects of GPS on Today's surveying.
15. Identify GPS errors:
    a. Clock errors of the receivers.
    b. Ionospheric refraction and tropospheric.
    c. Multipath interference.

d. Setup errors.
e. Selective availability.
f. Errors associated with the satellite orbital data.
g. A weak geomatic figure that results from a poorly located, four-satellite signal intersection.
h. Describe the nature of GPS error.

UNIT II – Traversing III (30hrs)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. describe the process of measuring horizontal angles.
2. identify the difference between 'direct angle measurement' and 'double angle measurement'.
3. define 'horizontal'/'zenith'/'nadir' angles as the three reference directions for vertical angles.
4. discuss the geographic and grid meridians.
5. describe the process of measuring vertical angles.
6. demonstrate the process of measuring horizontal angles.
7. demonstrate the process of measuring vertical angles.
8. demonstrate how to measure distances correctly (slope and horizontal).
9. apply different methods of distance measurements: (stadia, tape, pacing, self-reducing instruments, EDM, theodolite, subsistence bar, tacheometric, compass, total station, GPS).
10. tabulate field data for double angle checks at traverse stations.
11. compute all sections of the traverse sheet: reduce field angles, identify sources of error, use the proper method to eliminate error; round off angles; calculate lengths of lines from coordinates or Monuments etc.; use the relevant formulas to conduct adjustments to the data; calculate latitudes and departures errors; calculate the proportional ratio; calculate the area of the land from the survey data using double area formula.

Content:

1. Explain the process of measuring horizontal angles.
2. Express angles in degrees, minutes, and seconds.
3. Use direct angle measurement and double angle measurement to compute horizontal angles.
4. Explain with the aid of a diagram the relationship between horizontal, zenith and

nadir angles.

5. Explain with the aid of a diagram the relationship between geographic and grid meridian.
6. Explain the process of measuring vertical angles.
7. Use the theodolite to show the process of measuring horizontal angles.
8. Use the theodolite to show the process of measuring vertical angles.
9. Mean field angles to establish the correct size.
10. Use the appropriate tools to show how to measure horizontal and slope distances.
11. Methods of measuring distances: (stadia, tape, pacing, EDM, compute and insert field angles in field book).
12. Compute and reduce field angles.
13. Identify sources of errors.
14. Eliminate error using the correct method.
15. Demonstrate the rounding off of angles.
16. Balance the field angles.
17. Correct the field distances (e.g. For temperature).
18. Compute bearing and azimuth.
19. Compute the linear error of closure and the precision ratio of the traverse.
20. Compute the balanced latitude and balanced departures.
21. Compute the coordinates.
22. Compute the area of the land from survey data using the double area formula.

UNIT III – Curves (10 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. define a ‘curve’.
2. list different types of curves.
3. classify the methodology of curve technology.
4. differentiate between vertical and horizontal curves.
5. identify the various types of vertical angles.
6. identify the various types of horizontal angles.
7. describe the various sections of the curve.
8. draw the vertical curve.
9. label the vertical curve.
10. draw a horizontal curve.
11. label the horizontal curve.
12. examine the different formulas and techniques to calculate points on a curve.
13. calculate the following: the beginning of curve (BC), end of curve (EC), and point of

intersection (PI).
14. calculate the following for horizontal curve: tangent, long chord, length of curve, deflection of angle, curve deflection angles, back tangent, forward tangent, mid-ordinate, external.
15. locate field deflection angles.
16. compute curve deflection angles.
17. determine offset curves.
18. draw and label the offset curves.
19. compute the low and high points on a vertical curve.

Content:

1. Definition of ‘curve’.
2. Identify the different type of curves:
   a. Vertical
   b. Horizontal
3. Difference between ‘vertical’ and ‘horizontal’ curves.
4. Types of vertical curves:
   a. Sag curves
   b. Crest curves
5. Types of horizontal curves:
   a. Reverse curves
   b. Compound curves
   c. Broken back curves
6. Illustrate using a diagram to show the various curve parts of a curve.
7. Use neat and label diagram to show the construction of a vertical curve.
8. Use neat and label diagram to show the construction of a horizontal curve.
9. Calculate BC, EC, and PI.
10. From the curve diagram, calculate tangent, long chord, curve deflection angles, back tangent, forward tangent, mid-ordinate, external.
11. Show the relationship between the degree of curve(D) and the circle.
12. Demonstrate how to locate field deflection angles.
13. Calculate curve deflection angles.
14. Establish offset curves.
15. Use a label diagram to illustrate offset curves.
16. Computation of the low and high points on a vertical curve.

UNIT IV – Traversing IV: Control Surveying (20 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. explain the ordinance reference systems (UTM, MTM, USNG), Plane Grid coordinate, Lambert projection, and the Transverse Mercator projection.
2. state characteristics of the ordinance reference systems (UTM, MTM, USNG) Plane Grid coordinate, Lambert projection, and the transverse Mercator projection.
3. describe the following: elevation, grid factor, elevation factor, scale factor, distance, combined factors, interpolating distances from tables and known information, grid bearings, grid distances, and convergence.
4. extrapolate scale factor with various heights from tables.
5. calculate/compute the following: elevation, grid factor, elevation factor, scale factor, distance, combined factors, grid bearings, grid distances and convergence.
6. interpolating distances from tables and known information.
7. state the importance of using monuments in surveying.
8. identify the different types of monuments.
9. state the importance of using markers in surveying.
10. identify the different types of markers.
11. identify the various materials used in the construction of markers and monuments.
12. explain the following terms: trilateration, triangulation, and control ties.
13. design and construct a simple map by constructing grids, plotting coordinates, and plotting details.

Content:

1. Illustrate using diagrams to describe the following ordinance reference systems (UTM, MTM, USNG) plane grid coordinates.
2. Use diagrams to illustrate the Ordinance Reference Systems.
3. Show using diagrams the relationship between longitude, latitude, equator, and central meridian on the Ordinance Reference Systems.
4. Characteristics of the ordinance systems (UTM, MTM, USNG) plane grids coordinates.
5. Discuss the following: elevation, grid factor, elevation factor, scale factor, distance, combined factors, interpolating distances from tables and known information, grid bearings, grid distances and convergence.
6. Calculate scale factors with various heights from tables.
7. Calculate elevation factor, scale factor, combined factor, grid bearings and grid distances.
8. Explain the importance of how monuments are used in control surveys.

9. Materials are used as monuments and control markers.
10. Identify monuments and markers.
11. Identify horizontal and vertical markers.
12. Describe how triangulation was used for basic state or provincial controls.
13. Outline the different orders of triangulation.
    a. Primary
    b. Secondary
    c. Tertiary
14. Describe the use of trilateration as a means of control survey.
15. What is the importance of control ties.
16. Use diagrams to illustrate how triangulation and trilateration are used in control survey configuration.
17. Construct grids for a simple map.
18. Plot coordinates for a simple map.
19. Plot details for a simple map.

METHODS OF DELIVERY:

1. Lecture
2. Practical Demonstration
3. Field Experience
4. Discussions

METHODS OF ASSESSMENT AND EVALUATION:

1.	Common Individual Project	20%	(Unit III)
2.	In Class work	25%	
3.	Test	15%	
4.	Major Project	40%	(Unit II)

RESOURCE MATERIAL:

Recommended:

Gibson, R. (2009). *The Theory and Practice of Surveying: Containing All the Instructions Requisite for the Skillful Practice of This Art*. University of Michigan Library**.**

Kavanaugh, B. F. (2008). *Surveying: Principles and Applications* (8th ed.). New Jersey, NJ: Prentice Hall.

Nathanson, A. J., Lanzafama, M. & Kissam P. (2005). *Surveying Fundamentals and Practices* (5th ed.). New Jersey, NJ: Prentice Hall.

Online Resources:

Ebscohost database- https://www.ebscohost.com/

Springer E-Books- http://link.springer.com/

THE COUNCIL OF COMMUNITY COLLEGES OF JAMAICA

COURSE NAME:	Measurements and Estimating
COURSE CODE:	BLDG2402
CREDITS:	3
CONTACT HOURS:	45 (45 hours theory)
PRE-REQUISITE(S):	None
CO-REQUISITE(S):	None
SEMESTER:	IV

COURSE DESCRIPTION:

This course is designed to help students appreciate the importance of estimating in the construction of buildings. This course involves the mathematical calculation of building components to determine material quantity and cost.

COURSE OUTCOMES:

Upon successful completion of this course, students should:

1. appreciate documents forming the bills of quantity for the various areas of construction.
2. understand substructure and superstructure.
3. know the types of roofs and measuring templates.
4. understand finishes.
5. develop a bill quantity.
6. role & function of the estimator.

UNIT I – Estimating: Concept and Principles (5 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. differentiate between an ‘estimate’ and ‘guesstimate’.
2. explain the basic skills that an estimator must possess.
3. carry out basic calculations on the different types of estimating.
4. explain how errors can occur during estimating.
5. discuss the importance of the different costs associated with a construction project.
6. explain four purposes for the bill of quantity.
7. explain what is a checklist.
8. explain the importance of scheduling.

Content:

1. Define the term ‘estimator’.
2. Skill of estimator.
3. Types of estimating.
4. Errors of estimator.
5. Cost associated with a construction project.
6. Purpose for bill of quantity.
7. Define ‘checklist’.
8. Define ‘scheduling’.

UNIT II – Introduction to Measurements (6 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. identify the various documents within a ‘bill of quantity’.
2. state the functions of a bill of quantity.
3. list the processes involved in preparing a bill of quantity.
4. use measurement procedure in tabulating the dimension sheet.
5. properly format a dimension sheet:
    a. Titling
    b. Titling of dimension sheet column
    c. Abbreviations and spacing
    d. Units application
    e. Complete operations with underline or strikethrough

Content:

1. Documents in a bill of quantity.
2. Functions of a bill of quantity.
3. Preparing a bill of quantity.
4. Tabulating dimension sheets.
5. Formatting a dimension sheet.

UNIT III – Preliminary Site Work (7 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. list the items forming the dimension sheet.
    a. Site work
    b. Substructure
    c. Superstructure
    d. Enclosures
    e. Finishes
    f. Roofs
    g. Roofing taking finishes
2. analyze the plan to be used in the taking off of dimensions.
3. state dimension take-off for items on dimension sheet.
4. explain the nature of an ITEM.

Content:

1. Items forming a dimension sheet.
2. Analyzing plans for dimension take-off.
3. Dimension take-off for items on dimension sheet.
4. Nature of an ITEM.

UNIT IV – Sub Structure (7 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. define ‘substructure’.

2. analyze sectional views of the substructure.
3. apply measuring techniques to derive the quantity of each item in the substructure (timesing/dimension column).
4. input computed data in the squaring column.
5. complete a B.Q. for substructure.

Content:

1. What is a substructure?
2. Analyzing sectional views of the substructure.
3. Measuring techniques.
4. Inputting computed data.
5. Bill of quantity.

UNIT V – Super Structure (6 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. define ‘superstructure’.
2. analyze sectional views of superstructure using cavity wall and reinforced concrete block wall.
3. apply measuring techniques to derive the quantity of each item in the superstructure (timesing/dimension column).
4. input computed data in the squaring column.
5. complete B.Q. for the superstructure.

Content:

1. What is a superstructure.
2. Analyzing sectional views of the superstructure.
3. Measuring techniques.
4. Inputting computed data.
5. B.Q. for the superstructure.

UNIT VI – Finishes (6 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. identify types of finishes based on working drawings (rendering, painting, flooring, ceiling, cladding, metal work).
2. define ‘finishes’.
3. analyze working drawings and deduce from it, measurements for finishes.
4. apply measuring techniques to derive the quantity of each item of finishes (timesing/dimension column).
5. input computed data in the squaring column.
6. complete a B.Q.

Content:

1. Types of finishes.
2. What are finishes?
3. Analyzing work drawings for finishes.
4. Applying measuring techniques.
5. Inputting computed data.
6. B.Q. for finishes

UNIT VII – Roofs (8 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. identify types of roofs and roofing members based on working drawings.
2. define ‘roofs’.
3. analyze working drawings and deduce from it, measurements for roofs.
4. apply measuring techniques to derive the quantity of each item of roofs (description/dimension column).
5. input computed data in the squaring column.
6. complete a B.Q.

Content:

1. Types of roofs.
2. What is a roof?
3. Analyzing work drawings for roofs.
4. Applying measuring techniques.
5. Inputting computed data.
6. B.Q. for roofs.

METHODS OF DELIVERY:

1. Lectures
2. Projects
3. Field Trips
4. Discussions
5. Student Presentation

METHODS OF ASSESSMENT AND EVALUATION:

1. Tests	20%
2. Group Project	20%
3. Individual Project	60%

RESOURCE MATERIAL:

Prescribed:

Feigenbaum, L. & Dagostino, R. F. (2002). *Estimating in Building Construction* (6th ed).

New Jersey, NJ: Prentice Hall.

Pratt, D. (2010). *Fundamentals of Construction Estimating* (3rd ed.).

Florence, KY: Delmar Cengage Learning.

Online Resources:

Ebscohost database- https://www.ebscohost.com/

Springer E-Books- http://link.springer.com/

THE COUNCIL OF COMMUNITY COLLEGES OF JAMAICA

COURSE NAME:	Physics I
COURSE CODE:	PHYS1101
CREDITS:	4 (3 theory 1 practical)
CONTACT HOURS:	90 (45 hours theory, 45 hours practical)
PRE-REQUISITE(S):	
CO-REQUISITE(S):	
SEMESTER:	I

COURSE DESCRIPTION:

This course is designed to expose students to selected topics in Physics relating to the building and construction industry; to give them an awareness of how the Laws of Physics can affect the aesthetics, strength and design of buildings and other engineering structures.

COURSE OUTCOMES:

Upon successful completion of this course, students should:

1. apply the relevant use of physical law to explain the built environment.
2. appreciate the use of physical law to explain natural phenomena.
3. use mathematical techniques to predict the behaviour of physical systems.

UNIT I – Physical Measurement and Units (3 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. construct a table to include all the fundamental quantities of the International System (S.I system) and their related symbols.
2. differentiate between base quantities and derived quantities.
3. convert from the S.I units to empirical units and vice versa.
4. use prefixes and their symbols to express multiples and sub-multiples of S.I Units.

5. solve problems using the prefixes in the index notation.
6. use base quantities and units to check the homogeneity of physical equations.

Content:

1. Define the term ‘fundamental’ or ‘base quantity’.
2. List all seven fundamental quantities: Mass, Length, Time, Temperature, Current, Luminous Intensity, and Amount of Substance.
3. Define the term a ‘physical quantity’ as a quantity that possesses both a numerical magnitude and a unit. Example 25 Newtons (25 magnitude, Newtons SI unit).
4. Define the term ‘derived quantity’.
5. List at least five (5) examples of derived quantities to include but not limited to: area, volume, speed, density, force etc.
6. Prefixes: multiples from up to 10^{9} and sub-multiples up to10^{-9}.
7. Homogeneity of Equations.

UNIT II – The Composition of Matter (3 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. distinguish between the different states of matter (solid, liquid and gas).
2. create a model outlining the components (protons, neutrons, electrons) and structure of an atom (Bohr’s Model).
3. outline the composition of molecules, elements, compounds, and alloys.
4. assess the importance of the use of alloys in the field of construction.
5. distinguish between metals and non-metals.
6. justify the use of metals over plastic materials in the construction industry.
7. justify the use of plastic materials over metals in the construction industry.
8. identify at least five (5) characteristics of polymers and its use in the construction industry.

Content:

1. Define the term ‘matter’ as anything that occupies space and has mass.
2. The states of Matter.
3. Outline the composition of an atom: the spatial relationship between protons, neutrons, and electrons.
4. List characteristics of the particles of an atom to include the mass and charge.
5. Define the following terms: elements, molecules, compounds, and alloys.
6. List examples of the following: elements, molecules, compounds, and alloys.

7. Define the terms ‘metals’ and ‘non-metals’.
8. List of examples of metals and five non-metals.
9. List examples of the following: elements, molecules, compounds, and alloys.
10. Define the term ‘plastics’.
11. List examples of the following: elements, molecules, compounds, and alloys.
12. Define the term ‘polymers’.
13. Applications of common polymers.
14. List characteristics of polymers to include but not limited to: Strength, Resistance to chemical reactions, Weight comparison to metals, Resistance to heat, and Durability.

UNIT III – Properties of Material (12 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. explain the following mechanical properties:
   a. Malleability
   b. Toughness
   c. Elasticity
   d. Plasticity
   e. Ductility
   f. Hardness of material
   g. Brittleness
2. solve problems using Hooke’s Law, load, extension, and spring constant.
3. draw load-extension graphs.
4. analyze load-extension graphs.
5. conduct an experiment to validate Hooke’s law.

Content:

1. Define the following terms: Malleability, Toughness, Elasticity, Plasticity, Ductility, Hardness of material, Brittleness.
2. Give examples of materials having the following characteristics: Malleability,Toughness, Elasticity, Plasticity, Ductility, Hardness of material and Brittleness.
3. State Hooke’s Law.
4. Define the following terms: Load, Extension, Spring stiffness.
5. Calculate the gradient of a load-extension graph.

UNIT IV – Vectors (6 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. combine vectors using the Parallelogram Law.
2. use the method of components to determine the magnitude and direction of the resultantfor a combination of vectors.
3. calculate the magnitude and direction of the equilibrant vector for a system of vectors(show its position on a vector diagram).
4. use the principle of the polygon of the vectors to find the resultant of a system ofcoplanar vectors acting from a point.

Content:

1. Define a vector quantity as having both magnitude and direction.
2. Define a scalar quantity as having only magnitude.
3. Provide at least four (4) examples of a vector quantity, including but not limited to force, acceleration, momentum, velocity, displacement, etc.
4. Provide at least four (4) examples of scalar quantity, including but not limited to speed, distance, mass, volume, temperature etc.
5. Represent the horizontal and vertical components of a resultant vector using sine andcosine trigonometric ratios.
6. Explain what is meant by the equilibrant of a system of vectors (show its position on a vector diagram).
7. Parallelogram Law and Triangle Law.

UNIT V – Moments (9 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. define the term ‘moments of a force’ or ‘torque’.
2. state the principle of moments.
3. demonstrate the principle of moments using lever, crowbar, wheelbarrow, spanner and see-saw.
4. classify levers as 1^{st}, 2^{nd} and 3^{rd} class.
5. use the formula for moments to solve problems.

6. use the principle of moments to solve problems.
7. conduct an experiment to verify the principle of moments of a force.

Content:

1. Define the terms: 'load', 'effort' and 'fulcrum'.
2. Different classes of levers in relation to the location of load, effort, and fulcrum.
3. The principle of moments and its applications.

UNIT VI – Static Equilibrium (12 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. state the conditions for static equilibrium.
2. define the term 'centre of gravity'.
3. differentiate between stable, unstable, and neutral equilibrium.
4. solve simple problems involving forces acting on rigid bodies and particles.
5. conduct an experiment to verify that a body is in static equilibrium.

Content:

1. Define 'static equilibrium'.
2. Types of Equilibrium.
3. Conditions for the equilibrium of particles and rigid bodies.

UNIT VII – Dynamics (18 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. define speed, distance, acceleration, velocity, retardation, momentum, and displacement.
2. evaluate a distance-time, displacement-time, velocity-time, and acceleration-time graph to illustrate constant speed, constant velocity, uniform acceleration and non-uniform velocity.
3. calculate average velocity, distance travelled and acceleration using the appropriate graph.
4. state the equations of motion.
5. derive equations of motion from velocity-time graphs.
6. use the equations of motion to solve problems.

7. apply the principle of conservation of linear momentum to elastic, inelastic and completely inelastic collisions.
8. carry out experiments to determine the acceleration of a body.

Content:

1. Gradient of distance-time, displacement-time, velocity-time, and acceleration-time.
2. Area under graph under a velocity-time and acceleration-time.
3. Equations of motion: $v = u + at$, $s = ut + 1/2\ at^2$, $v^2 = u^2 + 2as$.
4. State the principle of conservation of linear momentum.

UNIT VIII – Work, Power, and Energy (6 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. define the term 'work'.
2. calculate the work done by a constant force.
3. define the term 'power'.
4. calculate the power for various situations.
5. define the term 'energy'.
6. distinguish between 'kinetic' and 'potential' energy.
7. explain the law of conservation of energy.
8. calculate the kinetic energy and potential energy of a body.
9. apply the law of conversation of energy to solve problems.
10. define the term 'efficiency'.
11. determine the 'efficiency of a system'.

Content:

1. Use the formula work done = force x distance.
2. Define energy as the ability to do work.
3. Define power as the rate at which work is done.
    a. Power = work done/time
    b. Power = Force x velocity
4. Types of energy: wind, hydroelectricity, geothermal, nuclear, sound, mechanical (kinetic and potential), electrical and chemical.
5. State the conversation of energy and its application in a regional setting: use of alternative energy within the region.

6. Efficiency = (output energy/input energy) x 100%

UNIT IX – Electricity (9 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. define the term ‘electricity’, ‘resistivity’, and ‘conductivity’.
2. explain what is meant by an electric field.
3. draw electric fields for two (2) like charges and two (2) unlike charges.
4. explain the concept of ‘static electricity’.
5. define electrical quantities resistance, voltage, potential difference, and quantity ofelectric charge.
6. state Ohm’s law.
7. distinguish between a ‘conductor’ and an ‘insulator’.
8. use Ohm’s law to solve simple problems including voltage, current and resistance.
9. determine the power of an electronic device.
10. conduct an experiment to verify Ohm’s Law.

Content:

1. Basic electrical terminologies.
2. Use the equations: V = IR, Q = It, E = QV to solve problems.
3. Series Circuits: example, calculating resistance, the voltage across each device, the current flowing through the circuit and devices.
4. Parallel Circuits: example, resistance, the voltage across each device, the current flowing through the circuit and devices.

UNIT X – Heat (12 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. define the term ‘heat’.
2. explain methods of heat transfer conduction, convection, and radiation.
3. explain the terms: specific heat capacity of a material, heat capacity, specific latent heat of fusion, and specific latent heat of vaporization.
4. calculate the heat capacity, specific heat capacity, and latent heat of vaporization for

materials.

5. conduct experiments to obtain the specific heat capacity of various materials.

Content:

1. Methods of heat transfer:
   Measuring heat

METHODS OF DELIVERY:

1. Lectures
2. Discussions
3. Demonstrations
4. Tutorials
5. Presentations
6. Experiments

METHODS OF ASSESSMENT AND EVALUATION:

A. Coursework	50%:
Mid-Semester Test 20%,	
Internal Coursework 10%	
Laboratory Assessment 20%	
B. Final Examination	50%

RESOURCE MATERIAL:

Prescribed:

Lambert, N., Lewis dos Santos, N. & Samuel, T.A. (2000). *Heinemann Physics for CXC*.

Oxford: Heinemann Educational Publishers.

Recommended:

Avision, J.H. (2014). *Physics for CXC*. Oxford University Press.

Giancoli, C. D. (2004). *Physics: Principles with Applications* (4th ed.).New Jersey, NJ: Prentice

Hall.

Online Resources:

Ebscohost database- https://www.ebscohost.com/

Springer E-Books- http://link.springer.com/

THE COUNCIL OF COMMUNITY COLLEGES OF JAMAICA

COURSE NAME:	Structures
COURSE CODE:	CONS2401
CREDITS:	3
CONTACT HOURS:	75 (30 hours theory and 45 hours practical)
PRE-REQUISITE(S):	Building Science (BLDG1201)
CO-REQUISITE(S):	Technical Mathematics II (MATH12)
SEMESTER:	IV

COURSE DESCRIPTION:

The course is to introduce the theory and principles of Structural Design. It covers such topics as an equilibrium of rigid structures, forces in trusses, bending stress, mechanical behaviour of materials, shear stress and torsional stress, beam deflection and rotation.

COURSE OUTCOMES:

Upon successful completion of this course, students should:

1. understand structural design principles.
2. appreciate the placement of different structures on properties varying in sizes and shapes.
3. understand the criteria for building structures.
4. understand the building code.

UNIT I – Equilibrium of Rigid Structures (12 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. define ‘equilibrium’.
2. explain the conditions for rigid body equilibrium.
3. identify the types of supports in an equilibrium rigid structure.

4. discuss the role of equilibrium in structures and the construction industry.
5. calculate the equilibrium of rigid structures.
6. explain a three-point pinned plain structure.
7. determine the resultant force acting on mass structures.
8. locate the centre of gravity of mass structures.
9. calculate the factor of safety in mass structures using restoring moment divided by overturning moment and total reactive forces resisting sliding divided by total forces tending to cause sliding.
10. conduct an experiment to verify that the net force and moments acting on a rigid body at rest is equal to zero.

Content:

1. Equilibrium of rigid structures.
2. Support reaction for complex beams, planes, frames, mass structures, arches, and suspension cables.
3. Hydrostatics – resultant force acting on an immersed mass structure.
4. Design consideration for mass structure due to water pressure – factor of safety.

UNIT II – Pin-Jointed Frame Structures (9 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. explain what is a ‘pin joint frame’ structure.
2. calculate the external statically determinacy of reactions.
3. calculate the internal statically determinacy.
4. determine the position of members in frames.
5. distinguish between struts and ties in frames.
6. determine the role of struts or ties in frame structures.
7. determine forces acting in a standard roof truss based on experimental data.

Content:

1. Forces in pin-jointed frames.
2. Determining types of members in a statically determinate truss system analytically or graphically.

UNIT III – Shear Force and Bending Moments (9 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. define ‘shear force’ and ‘bending moment’.
2. understand the importance of shear force and bending moment diagrams.
3. calculate the shear force and bending moment of beams and members of a simple portal.
4. construct shear force and bending moment diagrams for various structural elements.
5. determine the point of contraflexure of beams and simple portal.
6. calculating the maximum bending moment magnitude and position.
7. conduct an experiment to obtain shear force and bending moments data.

Content:

1. Determination of the values of shearing force and bending moment in beams and in the members of simple portals.
2. Construction of shearing force and bending moment diagrams resulting from point loads, uniformly distributed loads, non-uniformly distributed loads, and couples.
3. Determination of points of contraflexure and the position and magnitude of points of maximum bending moment.

UNIT IV – Mechanical Behaviour of Materials (9 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to understand and apply:

1. explain terms related to the mechanical behaviour of materials.
2. state and validate Hooke’s law using the stress-strain graph.
3. determine elongation of materials.
4. justify the importance of factor of safety.
5. conduct a tensile test of various materials.

Content:

1. Mechanical terminologies relating to materials (ductility, brittleness, hardness, toughness, elastic modulus of elasticity, elasticity, plasticity, stress and strain).
2. Hooke's Law in terms of stress and strain.
3. Attributes of the stress-strain graph.
4. Plot stress-strain graphs using.

UNIT V – Bending Stress (9 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. explain the effect of bending moment applied to a cross section.
2. explain the fundamental equation that governs the bending of a beam.
3. calculate the second moment of area of a cross section.
4. determine the moment of inertia using the parallel axis theorem.
5. determine the elastic section modulus of a section.
6. perform relevant calculations based on the bending equation.

Content:

1. Effect of Bending stress.
2. Neutral axis.
3. Calculation of the second moment of area, elastic section modulus.
4. Theory of Bending.
5. Moments of Resistance.
6. Bending stresses in symmetrical and asymmetrical sections, including compound sections.
7. Use of Flange plates to strengthen beams.

UNIT VI – Shear Stress (9 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. explain what is 'shear stress'.

2. outline the properties of shear stress.
3. determine the shear stress distributed in simple and compound beam sections.
4. calculate the shearing forces in the bolted or welded connections of compound beams.

Content:

1. Basic terminologies (shear stress, shear strain and shear modulus).
2. Complementary shear stress.
3. Shear in rectangular and non-rectangular beam sections.
4. Shear stress distribution in beams and compound beams.
5. Shear stress in bolted and welded connections.

UNIT VII – Torsional Forces (6 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. explain what is 'torsional stress'.
2. understand the development of shear stress due to the effect of applying torsional moments to solid, hollow or thin-walled circular cross-sections.
3. perform relevant calculations based on the torsion relationship equation as well as power transmission.
4. carry out an experiment relating to a shaft subjected to torsion.

Content:

1. Concept of torsional stress.
2. Torsion Relationship (torsion, shear stress and angle of twist relationships).
3. Polar second moment of area for solid circular shafts, hollow shafts and thin-walled circular shafts.
4. Power Transmission in shafts.

UNIT VIII – Beam Deflections and Rotations (9 marks)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. explain what is meant by 'beam deflection'.
2. explain what is meant by 'rotation in a beam'.
3. understand and apply the concept of the superposition of beams.
4. identify the causes of beam deflection.
5. determine the deflection and slope of simply supported beams that are simply supported at either end, simply supported beams with cantilever ends or cantilevered beams.
6. perform experiments to analyze the deflection and rotation of simply supported beams when loads are applied.

Content:

1. Beam deflection and rotation.
2. Concept of Superposition of beams.
3. Calculation of the deflection and rotation of loaded beams using Macaulay's method of successive integration. Treatment of concentrated loads and uniformly distributed loads covering all or part of the span and couples.
4. Calculation of the deflection and slope.

METHODS OF DELIVERY:

1. Lectures
2. Demonstrations
3. Discussions
4. Laboratory Exercise

METHODS OF ASSESSMENT AND EVALUATION:

1. Coursework 60%
    - Mid-semester test 20%
    - Common coursework 20%
    - Laboratory exercise 20%

2. Final Examination 40%

RESOURCE MATERIAL:

Prescribed:

Hulse, R. & Cain, J. (1991). *Structural Mechanics*. London: The Macmillan Press LTD.

Recommended Text:

Beer, F.P., Johnston, Jr. E.R., DeWolf, J.T. & Mazurek, D.F. (2012). Mechanics of Materials (6th edition). New York: McGraw-Hill.

Bechthold, M. & Schodek, L. D. (2007). *Structures* (6th ed.). New Jersey, NJ: Prentice Hall.

Buckner, C.D. (2003). *246 Solved Structural Engineering Problems* (3rd ed.). Professional publications.

Hielmstad, D. K. (2004). *Fundamentals of Structural Mechanics* (2nd ed.). New York, NY: Springer.

Online Resources:

Ebscohost database- https://www.ebscohost.com/

Springer E-Books- http://link.springer.com/

THE COUNCIL OF COMMUNITY COLLEGES OF JAMAICA

COURSE NAME:	Technical Drawing
COURSE CODE:	DRAW1101
CREDITS:	2
CONTACT HOURS:	60 hours ((15 hours theory 45 hours practical)
PRE-REQUISITE(S):	None
CO-REQUISITE(S):	
SEMESTER:	I

COURSE DESCRIPTION:

This course is designed to help students appreciate the language used in the technical field. The course involves the application of Technical Drawing skills to produce a site, floor, foundation, and roof framing plans, sections, and elevations. The course is designed to develop in students the basic principles of drawing so as to improve their skills and thus producing more complex industrial drawings.

COURSE OUTCOMES:

Upon successful completion of this course, students should:

1. know the importance of technical graphics in communications.
2. understand the principles of Geometry and Construction.
3. understand how to plot simple Loci diagrams.
4. represent first and third angle orthographic projection.
5. represent three-dimensional objects.
6. dimension various geometrical shapes and know how to identify and use various abbreviations.
7. understand Fits and Tolerances for various objects.
8. draw various fastening devices.
9. know the various elements of construction in the form of a document (constructing working drawings).

UNIT I – Introduction to Graphics Communications (3 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. define ‘technical graphics’ in communications.
2. differentiate between different lettering techniques.
3. explain the standards for graphic lettering.
4. do hand lettering on simple drawings.
5. list drafting tools.
6. demonstrate the uses of the various line types.

Content:

1. Technical graphics in communications:
    a. Lettering techniques and standards
    b. Hand lettering
    c. Lettering of titles
    d. Subtitles specifications
    e. Manual drafting tools
    f. Line types: Outline, Hidden lines, Construction line, Centre line etc.

UNIT II – Orthographic Projection (8 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. define forms of orthographic projection (plan view, front elevation, side elevation, sectional views, hidden details).
2. demonstrate the use of first and third-angle projection.
3. explain with examples the meaning of the following: principle plane of projection, auxiliary, vertical plane.
4. draw to scale views of a small residential building in first angle and third angle projection.

Content:

1. Orthographic Planes and views.
2. Building drawing in first and third angle projection.

UNIT III – Pictorial Drawings (4 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. demonstrate how to produce Isometric projections.
2. demonstrate how to produce Oblique projections.
3. complete isometric drawings from orthographic views.
4. complete oblique drawings from orthographic views.

Content:

1. Isometric projection.
2. Oblique projection.

UNIT IV – Dimensions and Abbreviation (6 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. define the term ‘dimension’.
2. scale a drawing accurately.
3. state the units of measurement.
4. list concepts of dimensioning.
5. construct and coordinate dimensions.
6. apply details to dimensions.
7. interpret dimensions and abbreviations on drawings.
8. detail dimensions for specific sites on drawings: diameter versus radius, holes and blind holes, counterbored holes, spot faces, countersinks, screw threads, and grooves.

Content:

1. Size and location dimension.
2. Units of measure.
3. Terminology: metric and imperial.
4. Basic concepts : extension, dimension, leader etc.
5. Size dimensions.
6. Location and orientation.
7. Coordinate dimensions.
8. Detail dimensioning.

UNIT V – Building Drawings (Constructing Working Drawings) (19 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. list drawing equipment used in building drawings.
2. design the layout of a drawing sheet.
3. number sheets/parts.
4. arrange and develop suitable title blocks.
5. do dimensioning of drawings.
6. complete freehand sketches of isometric projection, cabinet oblique projection, planometric projection, single-point perspective, two-point perspectives, plans and elevations, and orthographic projection.
7. apply suitable details to drawings.
8. produce working drawings for buildings (site plan, foundation plan, floor plan, elevations, sections, roof plans).

Content:

1. Drawing equipment
2. Laying out of drawing sheet
3. Parts number
4. Drawing numbers
5. Title blocks
6. Dimension
7. Orthographic Projection
8. Constructing working drawings:

a. Location map
b. Site plan
c. Foundation
d. Floors
e. Wall openings
f. Doors and windows specification
g. Roofs
h. Electrical wiring plans
i. Drainage and sanitation systems
j. Manhole, trap gully basin, drainpipes, septic tank, pipe field

METHODS OF DELIVERY:

1. Lectures
2. Student Presentation
3. Practical (workshops and in the field)
4. Group projects

METHODS OF ASSESSMENT AND EVALUATION:

1. Classwork/ Class Participation	20%
2. Major Project - Individual	40%
3. Major Project - Group	40%

Major Project - Individuals should be assessed from Units 2-4
Major Project - Group should be assessed from Unit 5

RESOURCE MATERIAL:

Recommended:

Giescke, E. F., Mitchell, A., Spencer, C. H., Hill, L. I., Dygdon, T. J., Novak, E. J., &

Lockhart, D. S. (2008). *Technical Drawing* (13th ed.). New Jersey, NJ: Prentice Hall.

Goetsch, D. L., Nelson, J. & Chalk, W. S. [2000]. *Technical Drawing*. McMillan Press.

Nelson, A. J., Goetsch, E. D., Rickman, L. R. & Chalk, S. W. (2008). *Technical Drawing and*

Engineering Communication (6th ed.). Florence, KY: Delmar Cengage Learning.

Online Resources:

Ebscohost database- https://www.ebscohost.com/

Springer E-Books- http://link.springer.com/

THE COUNCIL OF COMMUNITY COLLEGES OF JAMAICA

COURSE NAME:	Technical Mathematics I
COURSE CODE:	MATH1104
CREDITS:	3
CONTACT HOURS:	45 (45 hours theory) including tutorials
PRE-REQUISITE(S):	None
CO-REQUISITE(S):	None
SEMESTER:	I

COURSE DESCRIPTION:

The course will introduce students to the basic mathematical skills that will enable them to approach architectural problems analytically. This course will enable students to develop effective and efficient analytical skills as well as to appreciate the relevance of mathematics tothe broad field of architecture and the building industry.

COURSE OUTCOMES:

Upon successful completion of this course, students should:

1. know effective approaches to architectural problems.
2. develop effective and efficient analytical skills.
3. appreciate the relevance of mathematics to the broad field of architecture and the building industry.

UNIT I – The Real Number System (5 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. identify sets of numbers, for example, integers, whole numbers, and real numbers.

2. state and apply the identity, closure, inverse, commutative, associative, and distributive laws of real numbers.
3. state and apply the order properties of real numbers.
4. prove simple real number properties.

Content:

1. The Real Number System
    a. Axioms of the system – including commutative, associative, and distributive laws,and the order properties, non-existence of the multiplicative inverse of zero.
    b. Method of proof by:
        i. Direct
        ii. Induction

UNIT II – The Modulus (3 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. define the 'modulus function'.
2. sketch the modulus of the graph of a function in the Cartesian plane.
3. solve simple linear equations and linear inequalities involving modulus.

Content:

1. The Modulus
    a. Definition of modulus $|x| = \begin{cases} x, & x \geq 0 \\ -x, & x < 0 \end{cases}$
    b. Graph of $|f(x).|$
    c. $|x - y|$ as a distance function
    d. Equations and Inequalities
    e.g. $|x-a| = b,\ |x-a| = |x-b|, |x-a| < b$

UNIT III – Functions and Graphs (9 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. determine the domain and range of a function.
2. prove whether a simple function is a one-to-one function (injective function), onto function (subjective function), or one-to-one and onto function (bijective function).
3. find the inverse and composite of functions, e.g., simple exponential and logarithmic functions.
4. sketch graphs, functions, and their inverses, if they exist (include examples of linear, quadratic, exponential, and logarithmic functions in real-life situations).
5. determine values of exponential, logarithmic and piece-wise functions at a given point.

Content:

1. Functions:
    a. Domain
    b. Range
    c. Composition
    d. Inverse
2. Injective, subjective, bijective functions, inverse functions
3. Graphs:
    a. Exponential
    b. Logarithmic
    c. Piece-wise

UNIT IV – Co-ordination Geometry (13 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. use the value of the parameter to find the Cartesian coordinates of a curve.
2. convert parametric forms of curves to Cartesian representation.
3. identify the general equation of a circle $(x-a)^2+(y-b)^2=r^2$.

4. given the general equation of a circle, determine the coordinates of its centre (a,b) and radius, r.
5. find the equation of the tangent and normal to a circle at a given point on the circumference.

Content:

1. Curves: Cartesian equations and Parametric representations.
2. Equations of Circles.
3. Tangents and Normals to the circle.

UNIT V – Indices & Logarithms (12 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. state and apply the laws of indices to simplify expressions and solve equations (including expressions involving negative and rational indices).
2. state and apply the relationship $\log_a b = c \iff a^c = b$.
3. state and apply the laws of logarithms to simplify expressions and solve equations (including pseudo-quadratic equations).

Content:

1. Laws of indices, including negative and rational exponents.
2. Laws of logarithms.
3. Change of base.

METHODS OF DELIVERY:

1. Lectures
2. Demonstrations
3. Discussion

METHODS OF ASSESSMENT AND EVALUATION:

1. Coursework 40%
2. Test 20%
3. Final Examination 40%

RESOURCE MATERIAL:

Recommended:

Campbell, E. (2007). *Pure Mathematics for CAPE* vol. 1LMH Publishing.

Smith, D. R. & Peterson, J. (2006). *Introductory Technical Mathematics* (5th ed.).

Florence, KY: Delmar Cengage Learning.

Trefzgar, E. J., Gary, S. J., & Ewen, D. (2004). *Technical Mathematics* (2nd ed.).

New Jersey, NJ: Prentice Hall.

Online Resources:

Ebscohost database- https://www.ebscohost.com/

Springer E-Books- http://link.springer.com/

THE COUNCIL OF COMMUNITY COLLEGES OF JAMAICA

COURSE NAME:	Technical Mathematics II
COURSE CODE:	MATH1204
CREDITS:	3
CONTACT HOURS:	45 (45 hours theory) including tutorials
PRE-REQUISITE(S):	Technical Mathematics I – MATH1104
CO-REQUISITE(S):	None
SEMESTER:	II

COURSE DESCRIPTION:

This course will enable students to develop effective and efficient analytical skills as well as to appreciate the relevance of mathematics to the broad field of architecture and the building industry. An advanced course, students will look specifically at equations, trigonometry, limits, differentiation, and integration.

COURSES OUTCOMES:

Upon successful completion of this course, students should:

1. develop effective and efficient analytical skills.
2. appreciate the relevance of mathematics to the broad field of architecture and the building industry.
3. solve mathematical problems such as equations, trigonometry, limits, differentiation, and integration.

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UNIT I – Polynomials (6 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. add, subtract, multiply and divide polynomial functions.
2. factorize quadratic polynomials.
3. state and use the remainder theorem to find unknownsin a polynomial function.
4. completely factorize cubic polynomials.

Content:

1. Polynomials
2. Remainder Theorem and Factor Theorem

UNIT II – Trigonometry (10 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. solve problems involving arc length and area of a sector (with radian measures).
2. use inverse trigonometric functions cosecA, secA and cotA.
3. prove trigonometric identities.

Content:

1. The circle, radian measure, length of an arc and area of a sector.
2. Inverse Trigonometric Functions.
3. Trigonometric Identities involve:
   a. $\tan^2 A + 1 \equiv \sec^2 A,\ \cot^2 A + 1 \equiv Co\sec^2 A$
   b. sin2A, cos2A, tan2A
   c. sin(A±B), cos(A±B), tan(A±B)

UNIT III – Vectors (6 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. define 'scalar' and 'vector' quantities.
2. represent vectors using coordinate geometry up to $\Re^3$
3. determine the modulus of a vector.
4. determine the unit vector of a vector in the same direction.
5. calculate and use the scalar product of vectors to determine the angle between two vectors.

UNIT III – Limits (5 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. use limit the notation $\lim_{X \to a} f(x) = L$.
2. state and apply simple limit theorem to evaluate limits of polynomial, radical and rational functions.
3. use limits to investigate the continuity of a function at a given point.

Content:

1. Define the 'limit of a function'.
2. Evaluation of limits.
3. Continuity of function at a given point.

UNIT IV – Differentiation I (8 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. illustrate the concept of the derivative of a function at a point as the gradient of the tangent to the graph at the point.
2. use differentiation from first principles to find derivatives of such simple functions as $a, x, x^2$and

3. find the derivative of polynomial functions.
    a. Find derivatives of products and quotients of polynomials.
4. determine whether a function is increasing or decreasing at any point along the graph.
5. locate and classify the coordinates of stationary points using first and second derivatives.
6. use derivate as rates of change to solve real-world problems.

Content:

1. Gradient of the tangent at a point.
2. Differentiation by First principles.
3. Polynomial and rational function:
    i Product
    ii Quotient
    iii Chain Rule
4. Increasing and decreasing function.
5. Stationary points and their nature.
6. Applications of differentiation.

UNIT V – Integration I (7 hours)

Learner Outcomes:

Upon successful completion of this unit, students should be able to:

1. define integration as the inverse of differentiation.
2. find indefinite integrals of polynomial functions.
3. evaluate definite integrals ofpolynomial functions using integral theorems:
    a. Use the definite integral to find the area under the graph of a continuous function.
    b. Use of the trapezium rule to find the approximate area under the curve of rational functions.

Content:

1. Integration
2. Indefinite integrals
3. Definite integrals
4. Area under curves

METHODS OF DELIVERY:

1. Lectures
2. Demonstrations
3. Discussions

METHODS OF ASSESSMENT AND EVALUATION:

1. Coursework	40%
2. Test	20%
3. Final Examination	40%

RESOURCE MATERIAL:

Prescribed:

Campbell, E. (2007). *Pure Mathematics for CAPE* vol. 1 LMH Publishing.

Smith, D. R., & Peterson, J. (2006). *Introductory Technical Mathematics* (5th ed.).

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New Jersey, NJ: Prentice Hall.

Online Resources:

Ebscohost database- https://www.ebscohost.com/

Springer E-Books- http://link.springer.com/

Programme Requirements

Institutions seeking to offer this programme will have to demonstrate that they satisfy the minimum programme requirements indicated in the table below.

#	PREPARATORY PROGRAMME REQUIREMENTS FOR IMPLEMENTATION
1	**Required Facilities**
	Equipped Computer lab
	Equipped Skills training lab
	Adequate Classroom(s)
	Adequate Internet Access
	Equipped SEN facilities with respect to the target group
	Consider flexible learning options, where possible
2	**Learning/Training Resources Requirements (*Please indicate*)**
	Investigate the availability of curriculum, Learner guide, and Facilitator's manual
	Investigate the availability of Library materials
	Investigate the availability of multimedia content
	Investigate the availability of repurposed content for flexible learning
	Investigate the availability of repurposed content for SEN
3	**Required training Equipment/Tools/Software/Hardware**
	Determine the delivery material requirements (e.g. Electrical wires)
	Determine the required computer software/hardware
	Determine the required tools/equipment
	Determine the required online simulation resources, if applicable
	Determine the required assistive technologies based on specific SEN
4	**Human Resources Requirements**
	Determine adequacy of skill Instructors
	Determine the Instructor qualification requirements
	Determine the need for Lab Assistants
	Determine the required Assessors
	Determine the need for additional tutors to support flexible learning modality (if required)
	Determine the need for trained Instructors to support selected SEN groups
5	**Required Assessment Strategies to be Approved with accrediting body**
	Determine the requirements for traditional assessment modes
	Determine the requirements for Blended/flexible Assessment modes
	Determine the requirements for Special Education Needs assessment strategies
6	**Required Delivery Modality**
	Determine the requirements for flexible learning/ Blended (Developed content)
	Determine the requirements for Face to Face (Developed delivery content)
	Determine the requirements for SEN Modified Delivery Content
7	**Required Programme Budget/Costs/Fees**
	Calculate Programme delivery costs
	Calculate Student/Trainee fees
	Other costs

Resources for the Programme

1. Human Resource

   a. Lecturers - Lecturers on the programme possess a minimum educational qualification of a first degree in the relevant subject area and at least a certificate in teacher education. However, a vast majority of Community College Lecturers have Master's Degrees. In addition, several have years of Corporate Experience and professional qualifications, such as ACCA etc.

   a. Consultants – trainee

   b. Partners – work experience

   c. Resource personnel from relevant industries

2. Infrastructural Requirement

   a. Physical Facilities - Well-lit and ventilated classroom with appropriate furniture and audio-visual aids.

   b. ***State-of-the-art auto mechanic workshop with appropriate sections for body works, engine works, diagnostics, and chassis work.***

   c. ***Mechanical Technology workshop with bench and machine facilities, welding,painting, and casting capabilities.***

   d. ***Electrical/Electronic Technology workshop/laboratory with appropriate autoelectronics testing and experimentation facilities.***

   e. Information Technology - Computers with Internet Access and Software including:

      - Statistical software, e.g., PHstats.

- Accounting package, e.g., QuickBooks, Peachtree etc.
- Typing Tutor, e.g., Mavis Beacon.
- Productivity Tool, e.g., MS-Office 2010, Lotus Suite.
- MS-Windows 2010 and 2007 Operating system.
- Microsoft Office Suites/Access/Publisher etc.

f. Adequate Library facilities

g. Computers with 17” monitors.

h. Power supply units.

References

Commonwealth Network Jamaica- http://www.commonwealthofnations.org/sectors-jamaica/business/construction_and_engineering/

Construction task force (2009). Vision *2030 Construction Sector plan 2009-2030:* https://www.mtw.gov.jm/images/Bulletins/v2030construction.pdf

Labour Market Research and Intelligence Department. (2014). *2014-2015 HEART Trust NTA projected enrolment: Labour market alignment analysis*. Kingston, Jamaica: HEART Trust/NTA.

Labour Market Research and Intelligence Department. (2014). *Skills demand and employers' satisfaction survey 2014/2015*. Kingston, Jamaica: HEART Trust/NTA.

Planning Institute of Jamaica. (2014). *Economic and social survey- Jamaica 2013.* Kingston, Jamaica: PIOJ.

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