# Caledonian College of Engineering
# Course Work

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| **Name of the Programme** | BEng (GCU) |
| **Name of Module with Code** | Applicable Mathematics II (M2G121464) |
| **Module Team** | Dr. Javed Ali, Ms. Nabila Al Balushi, Mr. Yaqoob Al Rahbi |
| **Name of the course work** | Assignment |
| **Assessment weightage** | 24% |
| **Date of submission** | 28-11-2016 |

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| **Aim** | To build on the work of Level 1 and extend those aspects of Mathematics required in this and later stages of the degree Programme. |
| **Objective** | To make sure that students achieve the following learning outcomes:<br>- Mathematical notations, concepts and problem solving.<br>- competence in relevant applied mathematics and application to engineering problems |

## A. Knowledge and understanding of the topic

This is the factual foundation of the assignment. The essential facts should be accurate and broad enough in their scope to allow further application. It includes to

- Apply the knowledge of the Fourier series, half range sine and cosine series.
- Evaluate double integrals in Cartesian coordinates and by change of order of integration.
- Evaluate triple integrals in Cartesian coordinates and apply the knowledge.
- Understand analytic functions, mappings, Taylor and Laurent series, singularities.

## B. Application and analysis of the topic (Module specific Skill)

This is the way in which you analyze/ examine the factual information and how you interpret this information to add value to your answer (this could be in the form of conclusions, solutions, recommendations, etc.). It is also important to remember that the assessor must logically be able to follow the information in assignment submissions. It is expected whether the student has

- Fundamentals of the module
- Analytical skills of the module
- Numerical Skills of the module
- Acquired Knowledge to transform it to Engineering Applications

### C. The structure in terms of logic and coherence

Submissions should have a clear start and a clear end. Information within submissions should also be logical and well grouped. Report structure, Abstract, Introduction & Referencing, Result Analysis, and Conclusion & Future works.

### D. The use of relevant work examples and/or examples gained from further reading

Suggestions for further reading are contained within the course work and indicated at the end of the course work. These reading lists are not exhaustive and candidates are encouraged to read further and reference at the end of the course work using Harvard style of referencing.

**Marking scheme**

| Component | Weightage | Total Marks |
|---|---|---|
| Knowledge and understanding of the topic | 30% | 24 |
| Application and analysis of the topic (Module specific Skill) | 35% | 28 |
| The structure in terms of logic and coherence | 30% | 24 |
| The use of relevant work examples and/or examples gained from further reading | 5% | 4 |

**Please note all assignments shall subject to plagiarism.**

**Plagiarism**

It is important to understand what plagiarism is and how it can be avoided.

***"Unacknowledged copying from published sources (including the internet) or incomplete referencing".***

The following also constitute plagiarism:
• Copying sections of work from a friend/colleague.
• Having a friend/family member dictate something to you.
• Copying and pasting from the internet without citing the source.
• Copying directly from a study text quotation without citing the source.

**Quotations**
When using quotations from books, websites or journal articles you should cite the author and the year of publication then use the quote in quotation marks.

**Paraphrasing**
Paraphrasing is where you encapsulate another person's original idea, argument or conclusion in your own words. It is still necessary to attribute those ideas to the author, and you can do this by using the formatting outlined above for direct quotations, taking care to include the author's surname and the year of publication.

**Collaboration**

We acknowledge that you may undertake joint study with colleagues or as part of a formal training Programme. However, working with another person to write assignments is not acceptable. Your answers must be your own and in your own words.

**Referencing**

Harvard Referencing (CCE Style) First Edition 2013 should be followed for both in-text and listing references. This downloadable document can be found in our CCE portal at: http://portal.cce.edu.om/member/contentdetails.aspx?cid=628

**Ebrary Referencing**

Extended ebrary referencing is required to answer some of the questions as mentioned

**Instructions**

1. Plagiarism is a serious offence. In case of any plagiarism detected, penalty will be imposed leading to zero mark.
2. Course work and reports should be solved by the individual/group.
3. Course work and reports should be submitted on time and submission after deadline will be marked zero.
4. Course work should be submitted with an appropriate cover page, which can be obtained from the departmental assistant at the department.
5. Name, student identification and title of the course work to be written clearly and legibly on the cover page.
6. The completed course work is to be submitted to the departmental assistant on or before the deadline and record your name, date of submission and signature in the book with the departmental assistant.

**Grading of Course work**

- Outstanding 90% and above
- Excellent contribution 80% -89%
- Very Good Contribution 70% - 79%
- Good Contribution 60% - 69%
- Satisfactory Contribution 50% - 59%
- Inadequate Contribution Less than 50%

| Name and Signature of Module leader | |
|---|---|
| Dr. Javed Ali | Date: |

**M2H121713: [BENG] APPLICABLE MATHEMATICS II**

**ASSIGNMENT**

***Note:*** *Attempt all questions. Each question carries 10 marks. In each question p or q or both are used where p is the last nonzero digit of your student ID and q is the second last nonzero digit of your ID. Note that wherever pq appears, don't multiply them. For graph you can use the following online graphing calculator :*

**https://www.desmos.com/calculator**

1. **Traffic speed.** The following is the frequency distribution of travel times of motor-cars on a highway.
   Mean times (min): 53, 58, 63, 68, 73, 78, 83, 88, 93, 98, 103, 108,113, 118, 123,128, 133, 138, 143, 148, 153, 158, 163, 168.
   Corresponding frequencies: 10, 24, 109, 12(p+8), 12(p+3), 11p, 97, 102, 104, 92, 68, 72, 66, 61, 36, 33, 17, 15, 10, 8, 9, 6, 7, 3.
   Draw the histogram. How many peaks are there and what they tell us? What inference can be made from the mean time interval between the peaks?
   What is the variance and standard deviation? What is mean by variation in this data?

2. A dealer in recycled paper places empty trailers behind foods locations. The trailers are gradually filled by customers. The dealer picks up the trailers every other week. This schedule works as long as the average amount of recycled paper is more than 1600 cubic feet (the amount needed to justify operating costs of the trailer). The dealer's records for 18 2-week periods show the following volumes:

   1820, 1590, 1440, 1730, 1680, 1750, 1720, 18pq, 1900,
   1570, 1700, 1900, 1800, 1770, 2010, 1580, 1620, 1690.

   (a) Write the hypothesis.
   (b) What distribution (test statistic) is to be used? Write reasons.
   (c) Calculate the test statistic.
   (d) Build the 95% CI and check the value of the statistic inside the interval if it lies?
   (c) Identify the rejection region for the testing distribution.
   (e) Construct critical region and draw your conclusion using alpha = 0.05.
   (f) What are the implications of making the wrong decision?

3. Plot the given data on graph paper to get scatter diagram and then determine regression line of y on x. Graph this regression line on the same scatter diagram. Find the sum of distances from the line to the points. Explain what method of Least squares is.

| Density | 2411 | 2415 | 2425 | 2427 | 244p | 247(p+2) | 2480 | 2481 | 2483 | 2487 |
|---|---|---|---|---|---|---|---|---|---|---|
| Compressive strength | 49.9 | 50.7 | 52.5 | 53.2 | 57.p | 58.(p+2) | 60.1 | 60.2 | 60.5 | 60.9 |

Calculate also, the coefficient of correlation from the data and interpret the results.

http://site.ebrary.com/lib/caledonian/reader.action?docID=10921254

4. (a) Evaluate the double integral $\iint_D (px^2 + q\,y + 1)dA$ , where D is the region bounded b

(i) $y = x^2$ and $x = y^2$ (ii) $y = x,\ x = 1,$ and $y = p.$ (iii) $y = x^2$ and $y = p - x^2$
(iv) $px + qy = pq$ and the coordinate axes in the first quadrant.
(v) Half circle $x^2 + y^2 = 1$ in the upper half plane and $y = 0.$

(b) Evaluate the integral in part (a) by changing the order of integration in each case.

http://site.ebrary.com/lib/caledonian/reader.action?docID=10416597&ppg=208

5. Construct the vector field $\vec{F} = -p\,y\,\vec{i} + q\,x\,\vec{j}$ by finding at least 10 vectors. Find the Flux through (i) the square with side p (ii) a circle with radius p (iii) a triangle with vertices (-p,0), (p,0), (0,q). Find also the Curl $\vec{F}$ and explain what is mean by Curl $\vec{F}$ .

6. Evaluate $\int_C \vec{F}(\vec{r}) \bullet d\vec{r}$ , $\vec{F} = y^2\,\vec{i} + x^2\,\vec{j}$ , counterclockwise around the boundary of $C$ of the indicated region $R$ : (i) $1 \le x^2 + y^2 \le p + 1,\ x \ge 0,\ y \ge 0.$
(ii) $1 \le x^2 + y^2 \le p + 1,\ x \ge 0,\ y \le 0.$ (iii) Square with vertices (0,0), (p,0), (p, p), (0, p).
(iv) Triangle with vertices (-p, 0), (0,0), (0, p) (v) Circle with radius 2 and center (-p,p).

7. Find the volume of a tank whose base dimensions are $0 \le x \le p,\ 0 \le y \le q$ and its top is given by $z = px + qy + 10$ using (i) double integrals (ii) triple integrals. Draw also a clear sketch of this tank. (3D Plot)

8. Find the general solution of the first order differential equation and graph it for at least 10 values of C using desmos graphing calculator or any other software for graphs. (This graph is called direction field).

$$\frac{dy}{dx} = pq - 2x + 1$$

Find then the particular solution using the condition $y(p) = q$. Draw the graph of this solution on the same graph.

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