



## 24 Course Specification of Mathematics (4).

I. Course Identification and General Information:					
1	Course Title:	<i>Mathematics (4)</i>			
2	Course Code & Number:	Br104			
3	Credit hours:	C.H			Credit Hours
		Th.	Tu.	Pr.	Tr.
		2	2		
4	Study level/ semester at which this course is offered:	2 <sup>nd</sup> Year/ Level 2 <sup>nd</sup> semester			
5	Pre –requisite (if any):	Mathematics 3			
6	Co –requisite (if any):				
8	Program (s) in which the course is offered:	Bachelor of Science in Civil Engineering (B.S.C.E.)			
9	Language of teaching the course:	English and Arabic			
10	Location of teaching the course:	Classes			
11	Prepared By:	Dr. Adnan Al-Salihi			
12	Date of Approval				

II. Course Description:
<p>This course introduces <b>to students the</b> Integral transformations. <b>Topics</b> to be covered include:</p> <p><b>Laplace transforms:</b> definitions, properties and theorems, Inverse transform and Solution of ordinary and partial differential by Laplace transform, Laplace transform of special functions, Applications.</p> <p><b>Fourier series, integrals and transforms:</b> Definitions and properties, usual and arbitrary period, Fourier series of odd and even functions, Definitions and properties of Fourier transform with applications and Fourier transform of special functions.</p> <p><b>Z transforms:</b> Definitions and properties of Z transforms, including convergence, inversion techniques, application.</p>

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III. Course Intended learning outcomes (CILOs) of the course		Referenc ed PILOs
a.1	Recognize the definitions, basic properties and theorems of the Laplace Transforms, Fourier series, Fourier transforms and Z Transform and how to compute it for common functions.	A1
a.2	Identify inverse of Laplace, Fourier and Z transforms by a different method.	A3
b.1	Demonstrate proficiency in choose appropriate methods for perform a Laplace transform, Fourier series, Fourier transforms and Z transforms.	B1, B2
b.2	Compare between Laplace transforms, Fourier transforms, Z transforms and discrete Fourier transforms and its applications.	B2
c.1	Applying Laplace and Fourier transforms and Fourier series to solve the differential equations.	C3
c.2	Solve simple linear difference equations using the Z-transform approach.	C3
c.3	Build a mathematics models and solve problems in engineering applications using transformation theory.	C3
d.1	Effectively manage tasks, time, and resources.	D2
d.2	Communicate and work effectively in group and individually.	D1

(A) Alignment Course Intended Learning Outcomes of Knowledge and Understanding to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
a1- Recognize the definitions, basic properties and theorems of the Laplace Transforms, Fourier series, Fourier transforms and Z Transform and how to compute it for common functions	- Lectures. - Tutorials	- Written tests - Written assessment. - Report, homework and assignments.
a2- Identify inverse of Laplace, Fourier and Z transforms by a different method.	- Lectures. - Tutorials	- Written tests - Written assessment.

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		- Report, homework and assignments.
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**(B) Alignment Course Intended Learning Outcomes of Intellectual Skills to Teaching Strategies and Assessment Strategies:**

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
<b>b1-</b> Demonstrate proficiency in choose appropriate methods for perform a Laplace transform, Fourier series, Fourier transforms and Z transforms.	- Lectures. - Tutorials	- Written tests - Written assessment. - Report, homework and assignments.
<b>b2-</b> Compare between Laplace transforms, Fourier transforms, Z transforms and discrete Fourier transforms and its applications.	Lectures, Tutorials	- Written tests - Written assessment. - Report, homework and assignments.

**C Alignment Course Intended Learning Outcomes of Professional and Practical Skills to Teaching Strategies and Assessment Strategies:**

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
<b>c1-</b> Applying Laplace and Fourier transforms and Fourier series to solve the differential equations.	Lectures, Tutorials	- Written tests - Written assessment. - Report, homework and assignments.
<b>c2-</b> Solve simple linear difference equations using the Z-transform approach.	- Lectures. - Tutorials	- Written tests - Written assessment. - Report, homework and assignments.
<b>c3-</b> Build a mathematics models and solve problems in engineering applications using transformation theory.	- Lectures. - Tutorials	- Written tests - Written assessment. - Report, homework and assignments.

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<b>(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:</b>		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
<b>d1-</b> Effectively manage tasks, time, and resources.	- Lectures. - Tutorials	- Written tests - Written assessment. - Report, homework and assignments.
<b>d2-</b> Communicate and work effectively in group and individually.	- Lectures. - Tutorials	- Written tests - Written assessment. - Report, homework and assignments.

<b>IV. Course Content:</b>					
<b>A – Theoretical Aspect:</b>					
Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	contact hours
1	Introduction of Laplace transform	a1, b1, d1	<ul style="list-style-type: none"> <li>• Definition of Laplace transforms.</li> <li>• Laplace transforms of elementary functions.</li> </ul>	1	2
2	Properties of Laplace transform	a1, b1, d1	<ul style="list-style-type: none"> <li>• Properties and theorem of Laplace transform.</li> <li>• Laplace transform of special functions: unit step function, Dirac-delta function and periodic functions.</li> <li>• Generalization of Laplace Transforms by means of Gamma functions.</li> </ul>	1	2
3	Inverse Laplace transform	a1, a2, b1, d1, d2	<ul style="list-style-type: none"> <li>• Basic concepts and definitions.</li> <li>• Properties and theorems of Inverse Laplace transform.</li> </ul>	2	4
4	Methods to find Inverse Laplace transform	a1, a2, b1, c1, d1, d2	<ul style="list-style-type: none"> <li>• Inverse Laplace transform by partial fraction and convolution theorem</li> </ul>	1	2

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5	Application of Laplace transforms	a1, a2, b1, c3, c1, d1	<ul style="list-style-type: none"> <li>• Application of Laplace transform to ordinary and partial differential equations.</li> </ul>	1	2
6	Fourier series	a1, b1, d1, d2	<ul style="list-style-type: none"> <li>• Definition and Convergence.</li> <li>• Periodic and non-periodic Functions.</li> <li>• Fourier Cosine and Sine Series</li> <li>• Half intervals Fortier Series Convergence Theorem.</li> </ul>	1	2
7	Fourier series	a1, b1, d1, d2	<ul style="list-style-type: none"> <li>• Definition and Convergence.</li> <li>• Periodic and non-periodic Functions.</li> <li>• Fourier Cosine and Sine Series</li> <li>• Half intervals Fortier Series Convergence Theorem.</li> </ul>	1	2
8	Fourier integral	a1, b1, c1, d1, d2	<ul style="list-style-type: none"> <li>• Fourier integrals.</li> <li>• Fourier sine and cosine integrals</li> </ul>	1	2
9	Fourier transforms and Inverse Fourier transforms and its applications.	a1, a2, b1, c1, c3, b2, d1	<ul style="list-style-type: none"> <li>• Fourier transforms</li> <li>• properties and theorems of Fourier transforms.</li> <li>• Inverse Fourier transforms.</li> <li>• Fourier sine and cosine transforms.</li> <li>• The relation between Laplace and Fourier.</li> <li>• Application of Fourier series to partial differential equation</li> </ul>	3	6
10	Z Transforms	a1, b1, c2, d1	<ul style="list-style-type: none"> <li>• Concept of Z-Transform of a Discrete Sequence.</li> <li>• Distinction between Laplace, Fourier and Z Transforms.</li> </ul>	1	2
11	Inverse Z Transforms and applications	a1, a2, b1, b2, c1, c2, c3, d2	<ul style="list-style-type: none"> <li>• Region of Convergence.</li> <li>• Inverse Z-transform</li> <li>• Properties of Z-transforms.</li> <li>• Applications for Z-transforms.</li> </ul>	1	2
<b>Number of Weeks /and Units Per Semester</b>				<b>14</b>	<b>28</b>

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<b>B – Tutorial Aspect:</b>				
Order	Tasks/ Experiments	Number of Weeks	contact hours	Learning Outcomes
1	Introduction of Laplace transform and Laplace transform of elementary functions : Tutorial 11	1	2	a1,b1 ,d1
2	Properties and theorems of Laplace transform	1	2	a1,b1 ,d1
3	Inverse Laplace transform	1	2	a1,a2,b1,d1,d2
4	Methods to find inverse Laplace transform (partial fraction and convolution theorem)	2	4	a1,a2,b1, ,c1,d1, d2
5	Application of Laplace transforms to solve ordinary and partial differential equations.	1	2	a1,a2,c1, c3, c1,d1
6	Fourier series and Fourier Cosine and Sine Series	2	4	a1,b1,d1,d2
7	Fourier integrals	1	2	a1 ,b1,c1, d1, d2
8	Fourier transforms and Inverse Fourier transforms and its applications.	3	6	a1,a2,b1, c1,c3,b2,d1
9	Z Transforms	1	2	a1 ,b1, c2,d1
10	Inverse Z Transforms and applications	1	2	a1,a2,b1, b2,c1,c2, c3, d2
<b>Number of Weeks /and Units Per Semester</b>		<b>14</b>	<b>28</b>	

<b>V. Teaching strategies of the course:</b>
<ul style="list-style-type: none"> <li>• Lectures</li> <li>• Tutorials</li> </ul>

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<b>VI. Assignments:</b>				
No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1	Coursework assignments	a1, a2, b1, b2, c1, c2, c3, d1	During of semester	3.5
2	Quiz 1	a1, a2, b1, c, c3, d1	4	1
3	Quiz 2	a1, a2, b1, b2, c1, c2, c3, d1	10	1
4	Report	b2, c3	5	2

<b>VII. Schedule of Assessment Tasks for Students During the Semester:</b>					
No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1	Written assignment	During of semester	7.5	5%	a1, a2, b1, b2, c1, c2, c3, d1
2	Quizzes	4 <sup>th</sup> & 10 <sup>th</sup>	7.5	5%	a1, a2, b1, b2, c1, c2, c3, d1
3	Midterm exam	8 <sup>th</sup> week	30	20%	a1, a2, b1, c1, c3, d1
4	Final exam	End of semester	105	70%	a1, a2, b1, b2, c1, c2, c3
	<b>sum</b>		<b>150</b>	<b>100%</b>	

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## VIII. Learning Resources:

- Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher).

### 1- Required Textbook(s) (maximum two ).

- 1- Advanced Engineering Mathematics, sixth edition, by Dennis G. Zill, Jones & Bartlett Learning, 2018.
- 2- Mathematical Methods, S.Sivaiah , Laxmi publications(p) LTDA.
- 3- A Text Book of Engineering Mathematics, Vol (II), by Dr.Rajesh Pandey, word press, First edition, 2010.

### 2- Essential References.

- 1- Schaum's Outline of Theory and problems of Laplace Transforms, Murray R. Spiegel, Ph.D , Tata Mc-GRAW-HILL publishing Company, 2005.
- 2- Schaum's Outline of Theory and problems of Fourier Analysis, Murray R. Spiegel, Ph.D , Tata Mc-GRAW-HILL publishing Company, 2004.

### 3- Electronic Materials and Web Sites etc.

- 1- wolframMathworld  
<http://mathworld.wolfram.com/topics/CalculusandAnalysis.html>

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IX. Course Policies:	
1	<b>Class Attendance:</b> The students should have more than 75 % of attendance according to rules and regulations of the faculty.
2	<b>Tardy:</b> The students should respect the timing of attending the lectures. They should attend within 1 minutes from starting of the lecture.
3	<b>Exam Attendance/Punctuality:</b> The student should attend the exam on time. The punctuality should be implemented according to rules and regulations of the faculty for midterm exam and final exam.
4	<b>Assignments &amp; Projects:</b> The assignment is given to the students after each chapter, the student has to submit all the assignments for checking on time.
5	<b>Cheating:</b> If any cheating occurred during the examination, the student is not allowed to continue and he/she has to face the examination committee for <b>enquiries</b> .
6	<b>Plagiarism:</b> The student will be terminated from the Faculty, if one student attends the exam on another behalf according to the policy, rules and regulations of the university.
7	<b>Other policies:</b> <ul style="list-style-type: none"> <li>All the teaching materials should be kept out the examination hall.</li> <li>The mobile phone is not allowed.</li> <li>There should be a respect between the student and his teacher.</li> </ul>

Reviewed By	<b><u>Vice Dean for Academic Affairs and Post Graduate Studies</u></b> <b><u>Dr. Tarek A. Barakat</u></b> <b><u>Dr. Mohammad Algorafi</u></b>
	<b><u>Deputy Rector for Academic Affairs Dr. Ibrahim AlMutaa</u></b> <b><u>Dr. Ahmed mujahed</u></b> <b><u>Dr. Munaser Alsubri</u></b>

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## Template for Course Plan (Syllabus) of Mathematics (5)

<b>I. Information about Faculty Member Responsible for the Course:</b>						
<b>Name of Faculty Member</b>	Dr. Adnan Al-salihi	<b>Office Hours</b>				
<b>Location &amp; Telephone No.</b>	00967770499879	<b>SAT</b>	<b>SUN</b>	<b>MON</b>	<b>TUE</b>	<b>WED</b>
<b>E-mail</b>	Adnans2000@gmail.com					

II. Course Identification and General Information:						
1-	Course Title:	Mathematics (5)				
2-	Course Number & Code:	CE203				
3-	Credit hours:	C.H				Credit Hours
		Th.	Tu.	Pr.	Tr.	
		2	2			
4-	Study level/year at which this course is offered:	2nd Year/ Level 2nd semester				
5-	Pre –requisite (if any):	Mathematics 3				
6-	Co –requisite (if any):					
7-	Program (s) in which the course is offered	Bachelor of Science in Civil Engineering (B.S.C.E.)				
8-	Language of teaching the course:	English and Arabic				
9-	System of Study:	Credit Hours System				
10-	Mode of delivery:	Full Time				
11-	Location of teaching the course:	Classes				

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### III. Course Description:

This course introduces **to students the** Integral transformations. **Topics** to be covered include:

**Laplace transforms:** definitions, properties and theorems, Inverse transform and Solution of ordinary and partial differential by Laplace transform, Laplace transform of special functions, Applications.

**Fourier series, integrals and transforms:** Definitions and properties, usual and arbitrary period, Fourier series of odd and even functions, Definitions and properties of Fourier transform with applications and Fourier transform of special functions.

**Z transforms:** Definitions and properties of Z transforms, including convergence, inversion techniques, application.

### IV. Intended learning outcomes (ILOs) of the course:

• **Brief summary of the knowledge or skill the course is intended to develop:**

**a.1.** Recognize the definitions, basic properties and theorems of the Laplace Transforms, Fourier series, Fourier transforms and Z Transform and how to compute it for common functions.

**a.2.** Identify inverse of Laplace, Fourier and Z transforms by a different method.

**b.1.** Demonstrate proficiency in choose appropriate methods for perform a Laplace transform, Fourier series, Fourier transforms and Z transforms.

**b.2.** Compare between Laplace transforms, Fourier transforms, Z transforms and discrete Fourier transforms and its applications.

**c.1.** Applying Laplace and Fourier transforms and Fourier series to solve the differential equations.

**c.2.** Solve simple linear difference equations using the Z-transform approach.

**c.3.** Build a mathematics models and solve problems in engineering applications using transformation theory.

**d.1.** Effectively manage tasks, time, and resources.

**d.2.** Communicate and work effectively in group and individually.

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## V. Course Content:

- Distribution of Semester Weekly Plan Of course Topics/Items and Activities.**

### A – Theoretical Aspect:

Order	Topics List		Week Due	Contact Hours
1	Introduction of Laplace transform and Laplace transform of elementary functions	<ul style="list-style-type: none"> <li>Definition of Laplace transforms.</li> <li>Laplace transforms of elementary functions.</li> </ul>	1	2
2	Properties and theorems of Laplace transform	<ul style="list-style-type: none"> <li>Properties and theorem of Laplace transform.</li> <li>Laplace transform of special functions: unit step function, Dirac-delta function and periodic functions.</li> <li>Generalization of Laplace Transforms by means of Gamma functions.</li> </ul>	2	2
3	Inverse Laplace transform	<ul style="list-style-type: none"> <li>Basic concepts and definitions.</li> <li>Properties and theorems of Inverse Laplace transform.</li> </ul>	3	2
4	Methods to find inverse Laplace transform (partial fraction and convolution theorem methods)	<ul style="list-style-type: none"> <li>Inverse Laplace transform by partial fraction and convolution theorem</li> </ul>	4,5	4
5	Application of Laplace transforms to solve ordinary and partial differential equations.	<ul style="list-style-type: none"> <li>Application of Laplace transform to ordinary and partial differential equations.</li> </ul>	6	2
6	Fourier series and Fourier Cosine and Sine Series	<ul style="list-style-type: none"> <li>Definition and Convergence.</li> <li>Periodic and non-periodic Functions.</li> <li>Fourier Cosine and Sine Series</li> </ul>	7	4

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		•Half intervals Fortier Series Convergence Theorem.		
7	Midterm Exam		8	2
8	Fourier series and Fourier Cosine and Sine Series	•Definition and Convergence. •Periodic and non-periodic Functions. •Fourier Cosine and Sine Series •Half intervals Fortier Series Convergence Theorem.	9	2
9	Fourier integrals	•Fourier integrals. •Fourier sine and cosine integrals	10,11, 12	2
10	Fourier transforms and Inverse Fourier transforms and its applications.	•Fourier transforms •properties and theorems of Fourier transforms. •Inverse Fourier transforms. •Fourier sine and cosine transforms. •The relation between Laplace and Fourier. •Application of Fourier series to partial differential equation	13	6
11	Z Transforms	•Concept of Z-Transform of a Discrete Sequence. •Distinction between Laplace, Fourier and Z Transforms.	14	2
12	Inverse Z Transforms and applications	•Region of Convergence. •Inverse Z-transform •Properties of Z-transforms. •Applications for Z-transforms.	15	2
13	Final Exam		16	2
Number of Weeks /and Units Per Semester			16	32

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<b>B – Tutorial Aspect:</b>			
<b>Order</b>	<b>Topics List</b>	<b>Week Due</b>	<b>Contact Hours</b>
1	Introduction of Laplace transform and Laplace transform of elementary functions : tutorial 1	1	2
2	Properties and theorems of Laplace transform: tutorial 2	2	2
3	Inverse Laplace transform: tutorial 3	3	2
4	Methods to find Inverse Laplace transform (partial fraction and convolution theorem methods): tutorials 4& 5	4,5	4
5	Application of Laplace transforms to solve ordinary and partial differential equations: tutorial 6	6	2
6	Fourier series and Fourier Cosine and Sine Series: tutorial 7 & 8	7,8	4
7	Fourier integrals: tutorial 9	9	2
8	Fourier transforms and Inverse Fourier transforms and its applications: tutorials 10, 11 & 12	10,11,12	6
9	Z Transforms: tutorial 13	13	2
10	Inverse Z Transforms and applications: tutorial 14	14	2
<b>Number of Weeks /and Units Per Semester</b>		<b>14</b>	<b>28</b>

<b>VI. Teaching strategies of the course:</b>
<ul style="list-style-type: none"> <li>• Lectures</li> <li>• Tutorials</li> </ul>

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<b>VII. Assignments:</b>				
No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1	Coursework assignments	a1,a2,b1, b2,c1,c2,c3,d1	During of semester	3.5
2	Quiz 1	a1,a2,b1,c1 ,c3,d1	4 <sup>th</sup>	1
3	Quiz 2	a1,a2,b1, b2,c1,c2,c3,d1	10 <sup>th</sup>	1
	Report	b2,c3	5 <sup>th</sup>	2

<b>VIII. Schedule of Assessment Tasks for Students During the Semester:</b>				
Assessment	Type of Assessment Tasks	Week Due	Mark	Proportion of Final Assessment
1	Written assignment	During of semester	7.5	5%
2	Quizzes	4 <sup>th</sup> & 10 <sup>th</sup>	7.5	5%
3	Midterm exam	8 <sup>th</sup> week	30	20%
4	Final exam	End of semester	105	70%
	<b>sum</b>		<b>150</b>	<b>100%</b>

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<b>IX. Learning Resources:</b>	
• Written in the following order: (Author – Year of publication – Title – Edition – Place of publication – Publisher).	
<b>1- Required Textbook(s) (maximum two ).</b>	
1- Advanced Engineering Mathematics, sixth edition, by Dennis G. Zill, Jones & Bartlett Learning, 2018. 2- Mathematical Methods, S.Sivaiah , Laxmi publications(p) LTDA. 3- A Text Book of Engineering Mathematics, Vol (II), by Dr.Rajesh Pandey, word press, First edition, 2010.	
<b>2- Essential References.</b>	
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<b>X. Course Policies:</b>	
Unless otherwise stated, the normal course administration policies and rules of the Faculty of ----- apply. For the policy, see: -----	
1	<b>Class Attendance:</b> The students should have more than 75 % of attendance according to rules and regulations of the faculty.
2	<b>Tardy:</b> The students should respect the timing of attending the lectures. They should attend within 1 minutes from starting of the lecture.
3	<b>Exam Attendance/Punctuality:</b> The student should attend the exam on time. The punctuality should be implemented according to rules and regulations of the faculty for midterm exam and final exam.
4	<b>Assignments &amp; Projects:</b> The assignment is given to the students after each chapter, the student has to submit all the assignments for checking on time.
5	<b>Cheating:</b> If any cheating occurred during the examination, the student is not allowed to continue and he/she has to face the examination committee for <b>enquiries</b> .
6	<b>Plagiarism:</b> The student will be terminated from the Faculty, if one student attends the exam on another behalf according to the policy, rules and regulations of the university.
7	<b>Other policies:</b> <ul style="list-style-type: none"> <li>• All the teaching materials should be kept out the examination hall.</li> <li>• The mobile phone is not allowed.</li> <li>• There should be a respect between the student and his teacher.</li> </ul>

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