



Future Academy
Higher Future Institute for Specialized Technological Studies

Course Specification

1- Course information:

Course Code:	BSC 204
Course Title:	Differential Equations and Transformation
Year/level	2 nd
Academic Programs	Computer Science Program (B.Sc.)
Contact hours/ week	(theoretical 2 hrs, practical 2 hrs, total 3 hrs)

2- Course aims:

This course aims to provide students with degree and order of ordinary differential equations, formation of differential equations, solutions of first order differential equations by various methods. Solutions of general linear equations of second and higher orders with constant coefficients. Solutions of homogeneous linear equations. Solutions of various partial differential equations (wave equation- heat equations), particular solutions with initial conditions and applied it to real life problems.

3- Intended learning outcomes of the course (ILOs):

a- Knowledge and understanding:

On successful completion of this course, the student should be able to:

- a1- **Identify** the degree and order of ordinary differential equations.
- a2- **Recognize** the various techniques of solving first order ordinary differential equations.
- a3- **Recognize** the various techniques of solving second order ordinary differential equations.
- a4- **present** various partial differential equations (wave equation- heat equations).

b- Intellectual skills:

On completing this course, the student should be able to:

- b1- **Solve** different types of ODES.
- b2- **Discuss** the fundamental techniques and tools used to solve the various kind of ODES.
- b3- **Explain** the importance of partial differential equations and its applications.

c- Professional and practical skills:

At the end of this course, the student will be able to:

- c1- **Apply** the Problem-solving skills using appropriate procedures to various types of ODES.
- c2- **Illustrate** knowledge of the various applications of partial differential equations.

d- General and transferable skills:

On successful completion of this course, the student should be able to:

d1- **Compute** different types of ODES by various methods.

d2- **Managements** how to do Brainstorming discussions for solve ODES.

d3- **Working in groups** to find the general and particular-solutions and think creatively about new exercises.

d4- **life-long learning** the ability to gain numeracy skill.

4- Course contents

Week No.	Topics/units	Number of hours		ILO's
		Lecture hours	Practical/ Tutorial hours	
1	Solve of first order differential equations by separable equations	2	2	a1, b1, b2, b3, c1, c2, d1, d2, d4
2	Solve of first order differential equations by exact equations	2	2	a1, a2, b1, b2, c1, c2, d1, d2, d4
3	Transfer the non-exact equations to exact equation by integration factor	2	2	a1, a2, a3, b1, b2, b3, c1, c2, d1, d2, d4
4	Revision 1 on solution of first order differential equations + Quiz 1	2	2	b1, b2, b3, c1, c2, d1, d2, d4
5	Homogenous Equations	2	2	a1, a2, a3, b1, b2, b3, c1, c2, d1, d2, d4
6	First Order Linear ODE	2	2	a1, a2, a3, b1, b2, b3, c1, c2, d1, d2, d4
7	Midterm Exam			
8	Bernoulli Equations	2	2	a1, a2, a3, b1, b2, b3, c1, c2, d1, d2, d4
9	Solve of second order differential equations	2	2	a2, a3, b1, b2, c1, d1
10	Solve of second order differential equations	2	2	a2, a3, b1, b2, c1, d1
11	Revision 2 on solution of second order differential equations + Quiz 2	2	2	b3, c2, d2, d3
12	partial differential equations (wave equation)	2	2	a2, a3, a4, b3, c2, d2, d3, d4
13	partial differential equations (heat equations)	2	2	a2, a3, a4, b3, c2, d2, d3, d4
14	Revision 3 on partial differential equations	2	2	a2, b3, c2, d2, d3

5- Teaching and learning methods

Methods	ILO's																			
	a1	a2	a3	a4	a5	b1	b2	b3	b4	b5	c1	c2	c3	c4	c5	d1	d2	d3	d4	d5
Lectures	✓			✓		✓					✓	✓				✓		✓		
Practical sections		✓	✓				✓	✓									✓		✓	
Self-learning							✓	✓				✓						✓	✓	
Discussion groups		✓	✓				✓	✓									✓		✓	

6- Teaching and learning methods for Low-achieving students

- Extra teaching hours for those who need help.
- More quizzes to assess their ability for understanding the course.
- Encourage the teamwork for those students with other advanced ones to increase their participation and understanding.

7- Student assessment

Assessment method	Time	Grade weight (%)	week	ILOs
Course Work (Tutorial Exercise and Assignments)		10	Every week	a1, a2, a3, a4, b1, b2, b3, b4, c1, c2, d1, d4
Quiz 1		5	Week#4	a1, a2, a3, b1, b2, b3, c1, c2, d1, d2
Mid-Term exam		15	Week#7	a1, a2, a3, a4, b1, b2, b3, b4 c1, c2, d1, d2, d3, d4
Quiz 2		5	Week#11	a1, a2, a3, b1, b2, b3, c1, c2, d1, d2
Final written exam		60		a1, a2, a3, b1, b2, b3, c1, c2, d1, d2, d4

8-List of references

8.1. Student notebooks:

Lecture PowerPoint uploaded on classroom.

8.2. Essential textbooks:

- **Gabrial Nagy, 2001. “Ordinary Differential Equations”. Michigan State University.**

8.3. Recommended textbooks:

- **Carmen Chicone, 1999. “Ordinary Differential Equations with Applications”. Springer, New York.**
- **Richard Bronson, 1994. “Schaum’s outlines Differential Equations”, 2nd edition, McGraw-Hill.**

8.4. Journals, Periodical and Reportsetc.

<https://www.bing.com/ck/a?!&&p=a6e747d29576093246d8c2eafeae0fc43454284a16f370ae0efecf766dd99042JmldtHM9MTczMTcxNTIwMA&p=3&ver=2&hsh=4&fclid=23bc4517-0a77-6b22-063b-50120b2c6a4e&psq=journal+of+differential+equations&u=a1aHR0cHM6Ly93d3cuc2NpZW5jZWVpZC5jb20vam91cm5hbC9qb3VybmFsLW9mLWRpZmZlcmVudGlhbC1lcXVhdGlybnMvaXNzdWVz&ntb=1>

8.5. Websites

<https://www.bing.com/ck/a?!&&p=c4a68bb270fa7e4482e879905c79af6c8188c1ad061f506c33648006b872b116JmltdHM9MTczMTcxNTIwMA&ptn=3&ver=2&hsh=4&fclid=23bc4517-0a77-6b22-063b-50120b2c6a4e&psq=website+for+differential+equations&u=a1aHR0cHM6Ly93d3cuc3ltYm9sYWUuY29tL3NvbHZlci9vcmlRpbmFyeS1kaWZmZXJlbnRpYWwutZXF1YXRpb24tY2FsY3VsYXRvcg&ntb=1>

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