



Course Specifications

Course Title:	Ordinary differential equations II
Course Code:	MATH 3340
Program:	Bachelor of science in mathematics
Department:	Mathematics
College:	College of Science and Humanities
Institution:	College of Science and Humanities

Table of Contents

A. Course Identification	3
6. Mode of Instruction (mark all that apply)	3
B. Course Objectives and Learning Outcomes	3
1. Course Description	3
2. Course Main Objective.....	4
3. Course Learning Outcomes	4
C. Course Content	4
D. Teaching and Assessment	4
1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods	4
2. Assessment Tasks for Students	5
E. Student Academic Counseling and Support	5
F. Learning Resources and Facilities	5
1. Learning Resources	5
2. Facilities Required.....	5
G. Course Quality Evaluation	6
H. Specification Approval Data	6

A. Course Identification

1. Credit hours:	4(4,0,0)
2. Course type	
a.	University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/>
b.	Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/>
3. Level/year at which this course is offered:	Level: 8
4. Pre-requisites for this course (if any):	Math 3320, Math 3330
5. Co-requisites for this course (if any):	NONE

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	Weekly 4 hours	100%
2	Blended	None	0%
3	E-learning	None	0%
4	Distance learning	None	0%
5	Other	None	0%

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	48
2	Laboratory/Studio	0
3	Tutorial	0
4	Others (specify)	60
	Total	108

B. Course Objectives and Learning Outcomes

1. Course Description

First Order Systems – Conversion of Second and Higher Order Equations to First Order Systems – Differentiation of Vector and Matrix Functions – Solution of Linear Constant Coefficient Systems – Two Dimensional Systems and Phase Plane – Classification of Equilibria for Linear Systems – Qualitative behavior of Nonlinear Systems: Classification of Equilibria – Stability – Applications - Examples to the Pendulum and Population Models – Singular Points of Linear Second Order ODEs with Variable Coefficients – Frobenius Method – Bessel Functions – Properties of Bessel Functions – Modified Bessel Functions – Differential Equations Satisfied by Bessel Functions – Introduction to Boundary- Value Problems – Eigenvalues – EigenFunctions – Orthogonality of EigenFunctions – Sturm-Liouville Problem – Fourier Series – Fourier Sine and Cosine Series – Complete Fourier Series

2. Course Main Objective

The Objective is to make the students understand gain elaborate knowledge about linear ODE system , Differential Equations with variable coefficients and its series solution, , the concept of Eigen Value and Eigen Functions, Fourier Series and its applications

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	Knowledge and Understanding	
1.1	Acquire knowledge about linear ODE system	K1
1.2	Be familiar with the classification of Differential Equations with variable coefficients and the methods to solve them	K4
2	Skills :	
2.1	Able to form convert higher ODE into linear ODE system and solve it	S1
2.2	Able to find solution of Differential Equations with variable coefficients	S2

C. Course Content

No	List of Topics	Contact Hours
1	First Order Systems – Conversion from Higher order to first order system	4
2	Differentiation of vector and matrix functions	3
3	Solution of Linear Constant Coefficients – Two Dimensional System	4
4	Linear and Non Linear Systems	3
5	Classification of Equilibria – Stability	4
6	Applications – Pendulum and Population Models	3
7	Singular Points of Linear Second Order ODEs with Variable Coeffs-Forbenius Method	3
8	Bessel Functions and its Properties	4
9	Modified Bessel Functions – DEs satisfying Bessel Functions	4
10	Introduction to Boundary Value Problems	4
11	Eigen Values, Eigen Functions , Orthogonality	4
12	Sturm-Liouville Problem – Fourier Series	6
13	Fourier Sine and Cosine Series – Complete Fourier Series	4
Total		48

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	Knowledge and Understanding		
1.1	Acquire knowledge about linear ODE system	1. Class Room Lectures 2. Interactive sessions 3. Exclusive Office Hours for clearing doubts in small groups	1. Two Internal Exams 2. At least two Quiz 3. End Semester Exam
1.2	Be familiar with the classification of Differential Equations with variable coefficients and the methods to solve them		
2.0	Skills		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.1	Able to form convert higher ODE into linear ODE system and solve it	1. Application oriented exercises during tutorial session 2. Homework to improve the analytical skills	1. Homework 2. Assignments 3. Quiz
2.2	Able to find solution of Differential Equations with variable coefficients		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Mid Term Exam I	6	20%
2	Quiz	4 & 10	5%
3	Mid Term Exam II	13	20%
4	Continuous Assessment – Homework, Assignment, Attendance etc.	--	5%
5	End Semester Exam	15	50%

*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

1. Exclusive Office Hours – 5 Hours per week
2. Academic Advising for Students – 1 Hour per week

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	-Edwards C., and Penney D., "Elementary Differential Equations with Boundary Value Problems", 5th ed. Upper Saddle River, NJ: Prentice Hall, (2003), ISBN: 013145773X. - William Boyce, and Richard C. DiPrima, "Elementary Differential Equations and Boundary Value Problems", 7th ed, John Wiley and Sons
Essential References Materials	
Electronic Materials	Paul's Online Series, Blackboard
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration)	Classrooms with Smart boards with seating facilities for at least 30 students

Item	Resources
rooms/labs, etc.)	
Technology Resources (AV, data show, Smart Board, software, etc.)	Smartboard, Internet Connection for Blackboard
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	NIL

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of Teaching	Students, Graduates	Course Evaluation and Program Evaluation Survey (Indirect)
	Program Leaders	Peer Review (Direct)
Achievement of CLOs	Faculty and Quality Personnel	Direct (Tests and Quiz) and Review of Course Report
Quality of Learning Resources	Students	Course Evaluation (Indirect)
	Graduates	Program Evaluation (Indirect)
Facilities	Students / Graduates	Course and Program Evaluation (Indirect)
	Faculty	Faculty Survey (Indirect), Course Reports (Direct)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	