



## Course Specifications

<b>Course Title:</b>	<b>NUMERICAL ANALYSIS</b>
<b>Course Code:</b>	<b>MATH 3370</b>
<b>Program:</b>	<b>BACHELOR OF SCIENCE IN MATHEMATICS</b>
<b>Department:</b>	<b>MATHEMATICS</b>
<b>College:</b>	<b>College of Science and Humanities in Al-Kharj</b>
<b>Institution:</b>	<b>PRINCE SATTAM BIN ABDUALZIZ UNIVERSITY</b>

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## A. Course Identification

<b>1. Credit hours:</b> 04
<b>2. Course type</b> <b>a.</b> University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/> <b>b.</b> Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/>
<b>3. Level/year at which this course is offered:</b> Level 8
<b>4. Pre-requisites for this course (if any):</b> Math 3330, Math 2250
<b>5. Co-requisites for this course (if any):</b> None

### 6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	Weekly 4hours	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	--
3	Tutorial	--
4	Others (specify)	60
	<b>Total</b>	<b>108</b>

## B. Course Objectives and Learning Outcomes

### 1. Course Description

Types of Errors – Interpolation – Numerical Differentiation – Numerical Integration – Solving Algebraic Systems of Equations by Iterations – Root Finding – Solving System of Nonlinear Equations – Methods of Solving First Order Initial Value Ordinary Differential Equations – Converting Higher Order Ordinary Differential Equations to First Order Ones – Solving Systems of First Order Initial Value Ordinary Differential Equations – Finite Differences – Solving Two Point Boundary Value Problems by Finite Differences

### 2. Course Main Objective

The Objective is to make the students gain awareness about concepts of elementary numerical analysis such as errors, interpolation, iterative method of solving equations, numerical differentiation and integration etc.

### 3. Course Learning Outcomes

CLOs		Aligned PLOs
1	<b>Knowledge and Understanding</b>	
1.1	Acquire knowledge about type of errors Be familiar with formulating interpolation and iterative methods for linear systems	K1
1.2	Understand the concept of numerical differentiation, numerical integration and numerical methods for DEs	K4
2	<b>Skills :</b>	
2.1	Able to convert higher order DE to first order DE and solve the same and Apply iterative techniques	S2
2.2	Able to solve system of nonlinear equations and compute the roots Able to compute solution of DE by applying boundary conditions	S1

### C. Course Content

No	List of Topics	Contact Hours
1	Types of Errors – Interpolation	4
2	Numerical Differentiation	4
3	Numerical Integration	4
4	Solving Algebraic system using Iteration	4
5	Root Finding – Solution of nonlinear equations	8
6	Solution of First order Initial Value ODE	6
7	Converting Higher order DE to First Order and their solutions	6
8	Finite Differences	6
9	Two Point Boundary Value Problems by Finite Differences	6
<b>Total</b>		<b>48</b>

### 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	<b>Knowledge and Understanding</b>		
1.1	Acquire knowledge about type of errors Be familiar with formulating interpolation and iterative methods for linear systems	1. Class Room lectures 2. Interactive sessions	1. Two Internal Exams 2. Atleast two Quiz
1.2	Understand the concept of numerical differentiation, numerical integration and numerical methods for DEs	3. Exclusive Office Hours for clearing doubts in small groups	3. End Semester Exam
2.0	<b>Skills</b>		
2.1	Able to convert higher order DE to first order DE and solve the same and Apply iterative techniques		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.2	Able to solve system of nonlinear equations and compute the roots Able to compute solution of DE by applying boundary conditions	1. Application oriented exercises during tutorial session. 2. Homework to improve the analytical skills	1. Homework 2. Assignments 3. Quiz

## 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

<b>Required Textbooks</b>	- Burden, Richard L. and Douglas Faires J., "Numerical Analysis", 7th ed. Belmont, CA: Brooks Cole, (2000), ISBN: 0534382169 - Strang Gilbert. "Introduction to Numerical Analysis ", 2nd ed. Wellesley, MA: Wellesley- Cambridge Press, March (2004), ISBN: 0961408898
<b>Essential References Materials</b>	NIL
<b>Electronic Materials</b>	Paul's Online Series

<b>Other Learning Materials</b>	such as computer-based programs/CD, professional standards or regulations and software.  Lecture Notes Prepared by the Department of Mathematics
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## 2. Facilities Required

Item	Resources
<b>Accommodation</b> (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms with Smart boards with seating facilities for at least 30 students
<b>Technology Resources</b> (AV, data show, Smart Board, software, etc.)	Smartboard, Internet Connection for Blackboard
<b>Other Resources</b> (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

<b>Council / Committee</b>	
<b>Reference No.</b>	
<b>Date</b>	