MTS 202 – Numerical Analysis I

COURSE PARTICULARS

Course Code: MTS 202  
Course Title: Numerical Analysis I  
No. of Units: 3  
Course Duration: Two hours of theory and one hour of tutorial per week for 15 weeks.  
Status: Compulsory  
Course Email Address:  
Course Webpage:  
Prerequisite: MTS 101, MTS 102

COURSE INSTRUCTORS

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COURSE DESCRIPTION

This course is the first course in numerical analysis designed for students in mathematics, physical sciences, engineering, mineral and earth sciences. The focus of the course is to equip students with basic useful skills to solve numerically both theoretical and empirical problems leading to linear and nonlinear equations. Topics to be covered include numerical solution of
algebraic and transcendental equations; curve fitting; error analysis; interpolation and approximation; zeros of non linear equations in one variable; system of linear equations; numerical differentiation and integration.

**COURSE OBJECTIVES**

The objectives of the course are to:
- provide students with opportunity to identify real life problems leading to algebraic, transcendental, non-linear and system of linear equations.
- introduce students to different numerical methods to solve these equations;
- apply these numerical methods to solve theoretical and real life problems leading to these equations.

**COURSE LEARNING OUTCOMES / COMPETENCIES**

At the completion of the course, student will be able to:

*(Knowledge based)*
- classify and explain any given problems into algebraic, transcendental, non-linear and system of linear equations;
- identify real life problems leading to any of these equations;
- enumerate types of errors and their significance in numerical computation;

*(Skills)*
- solve transcendental, non-linear and system of linear equations with appropriate numerical methods
- interpolate any given functions at different point-sets of the independent variable and obtain the values of the dependent variable from the interpolant;
- estimate error bounds and stopping criteria of some numerical methods for solving transcendental, non-linear and system of linear equations.

**GRADING SYSTEM FOR THE COURSE**

This course will be graded as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Class Attendance</td>
<td>5%</td>
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<tr>
<td>Quizzes/Assignments</td>
<td>15%</td>
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<tr>
<td>Test(s)</td>
<td>10%</td>
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<tr>
<td>Final Examination</td>
<td>70%</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>100%</strong></td>
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GENERAL INSTRUCTIONS

Attendance: It is expected that every student will be in class for lectures and also participate in all practical exercises. Attendance records will be kept and used to determine each person’s qualification to sit for the final examination. In case of illness or other unavoidable cause of absence, the student must communicate as soon as possible with any of the instructors, indicating the reason for the absence.

Academic Integrity: Violations of academic integrity, including dishonesty in assignments, examinations, or other academic performances are prohibited. You are not allowed to make copies of another person’s work and submit it as your own; that is plagiarism. All cases of academic dishonesty will be reported to the University Management for appropriate sanctions in accordance with the guidelines for handling students’ misconduct as spelt out in the Students’ Handbook.

Assignments and Group Work: Students are expected to submit assignments as scheduled. Failure to submit any given assignment, as at when due, will earn the student zero for that assignment. Only under extenuating circumstances, for which a student has notified any of the instructors in advance, will late submission of assignments be permitted.

Code of Conduct in Lecture Rooms and Laboratories: Students should turn off their cell phones during lectures. Students are prohibited from engaging in other activities (such as texting, watching videos, etc.) during lectures. Food and drinks are not permitted in the laboratories.

READING LIST


Legend
1- Available in Departmental/School Libraries
2- Available on the Internet.
3- Available as Personal Collection
4- Available in local bookshops.
<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 2</td>
<td>Introduction and Course Overview Solutions to algebraic equations</td>
<td>In this first class, the expectation of the students from the course will be given.</td>
</tr>
<tr>
<td>3 - 4</td>
<td>Solutions transcendental equations</td>
<td>Class quiz and exercises will be administered to the students.</td>
</tr>
<tr>
<td>5- 6</td>
<td>Curve fitting; Error analysis</td>
<td>Class exercises and take-home assignments will be given to the students.</td>
</tr>
<tr>
<td>7</td>
<td>Interpolation and approximation</td>
<td>Class quiz and exercises will be administered to the students.</td>
</tr>
<tr>
<td>8 -9</td>
<td>Determination of zeros of non-linear equations of one variable</td>
<td>Class quiz will be administered to the students.</td>
</tr>
<tr>
<td>Mid-Semester’s Test</td>
<td>Review of previous work and administration of mid-semester’s test</td>
<td></td>
</tr>
<tr>
<td>10 – 11</td>
<td>System of linear equations</td>
<td>Class quiz and exercises will be administered to the students.</td>
</tr>
<tr>
<td>12 – 13</td>
<td>Numerical differentiation</td>
<td>Class quiz and exercises will be administered to the students.</td>
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<tr>
<td>14</td>
<td>Numerical integration</td>
<td>Class quiz and exercises will be administered to the students.</td>
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<tr>
<td>15</td>
<td>Revision</td>
<td>Students prepare for semester’s examinations. Evaluation will be done to assess how far the students’ expectations for the course have been met.</td>
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