DE LA SALLE UNIVERSITY – MANILA
COLLEGE OF SCIENCE
Mathematics Department

SYLLABUS

COURSE CODE	MTH631M/D
COURSE TITLE	Numerical Analysis
CLASS DAY & TIME	
ROOM	
NAME OF FACULTY	
COURSE CREDIT	3 Units
CONTACT NO. (DEPT)	(02) 536-0270, (02) 524-4611 loc. 420/413
TERM/SCHOOL YEAR	

COURSE DESCRIPTION

This course covers the different numerical methods of solving mathematical and scientific problems such as solving for the roots of nonlinear equations, numerical differentiation and integration, interpolating polynomials and ordinary differential equations.

COURSE OBJECTIVES

The students will:

1. Appreciate the value of mathematical reasoning and analysis in applications
2. Realize the importance of mathematical principles and skills in solving some types of problems
3. Develop critical and analytical thinking, accuracy, neatness when using mathematics
4. Realize that a large number of problems cannot be solved by prepared “theoretical” formulas; instead, the solution is arrived at by a succession of approximations until the desired accuracy is obtained
5. Appreciate the usefulness of the computer and see how its use removed the drudgery involved in computations and how by use of programming techniques sequential processes are placed in the correct order
6. Exhibit values like:
    - cooperation through group study;
    - honesty by claiming credit only for the work he has done;
    - zeal and seriousness of intent to learn by participating actively in class discussion, doing his homework regularly and consulting his mentor;
    - patience, perseverance and diligence by solving assigned exercises completely including the difficult ones;
    - faith by doing what is right and giving his best in performing any assigned task;
    - show concern for the community through sharing of know-how and resources during group discussion;
    - self-reliance by being able to solve problems independently.

Topic/Subtopic	Learning Strategies/ Activities	Week/Meeting
1. SOLUTIONS OF NONLINEAR EQUATIONS 1.1 Bracketing Methods 1.1.1 Bisection Method 1.1.2 Regula Falsi Method 1.2 Fixed Point Methods 1.2.1 The Fixed Point Problem 1.2.2 Newton's Method 1.3 The Secant Method	Lecture-Discussions Problem Solving Hands-on Exercises	5 hrs
2. SYSTEMS OF LINEAR EQUATIONS 2.1 Gaussian Elimination Method 2.2 LU-Decomposition Method 2.3 Gauss-Seidel Method 2.4Gauss-Jacobi Method	Lecture-Discussions Problem Solving Hands-on Exercises	7 hrs
3. THE INTERPOLATING POLYNOMIAL 3.1 The Lagrange Form of the Interpolating Polynomials 3.2 The Method of Undetermined Coefficients 3.3 Divided Differences 3.4 Newton's forward-difference and backward-difference formulas 3.5 Error of Polynomial Interpolation	Lecture-Discussions Problem Solving Hands-on Exercises	7 hrs
MIDTERM EXAMINATION		2 hrs
4. NUMERICAL INTEGRATION AND DIFFERENTIATION 4.1 Numerical Differentiation Using the Interpolating Polynomial 4.2 Newton-Cotes Formulas 4.3 Composite Rules for Numerical Integration 4.3.1 Trapezoidal Rule 4.3.2 Simpson's 1/3 Rule 4.3.3 Simpson's 3/8 Rule 4.3.4 Romberg Integration 4.3.5 Gaussian Integration 4.3.6 Errors of Quadrature Formulas	Lecture-Discussions Problem Solving Hands-on Exercises	7 hrs
5. NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS 5.1 One-Step Method 5.1.1 Euler's Method 5.1.2 Taylor's Series Methods of Order k 5.1.3 Runge-Kutta Methods 5.2 Linear Multi-Step Methods 5.2.1 Adams' Method as Predictor-corrector methods 5.2.2 Milne's Method	Lecture-Discussions Problem Solving Hands-on Exercises	7 hrs
6. EIGENVALUES AND EIGENVECTORS 6.1 Power Method 6.2 Inverse Power Method 6.3 Reyleigh Quotients	Lecture-Discussions Problem Solving Hands-on Exercises	5 hrs
7. DISCRIMINANT ANALYSIS 7.1 Description of Discriminant Analysis 7.2 Objectives of Discriminant Analysis 7.3 Assumptions of Discriminant Analysis 7.4 Linear & Quadratic Discriminant Functions 7.5 Applications of Discriminant Analysis	Lecture-Discussions Problem Solving Hands-on Exercises	6 hrs
8. CANONICAL CORRELATION ANALYSIS 8.1 Objectives of Canonical Correlation Analysis 8.2 Assumptions of Canonical Correlation Analysis 8.3 Canonical Functions	Lecture-Discussions Problem Solving Hands-on Exercises	3 hrs

Topic/Subtopic	Learning Strategies/ Activities	Week/Meeting
8.4 Applications of Canonical Correlation Analysis		
FINAL EXAMINATION		3 hrs

COURSE REQUIREMENTS

- Midterm Examination
- Final Examination
- 2 Problem Sets
- Learning Output – Portfolio on each Chapter

SOURCES

TEXTBOOKS

- Burden, Richard L. and Faires, J. Douglas, *Numerical Analysis*, Boston, MA : Brooks/Cole, Cengage Learning, 2011.
- Chapra, Steven C. and Canale, Raymond P., *Numerical Methods for Engineers,* Boston : McGraw-Hill Higher Education 2010.
- Chapra, Steven C., *Applied Numerical Methods with MATLAB® for Engineers and Scientists,* New York : McGraw-Hill, 2012.

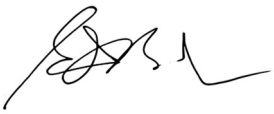
REFERENCES

- Burden, Richard L. and Faires, J. Douglas, *Numerical Methods,* Boston, MA : Brooks/Cole, Cengage Learning, 2013.
- Cheney, Ward and Kincaid, David, *Numerical Mathematics and Computing (Seventh Edition)*, Boston, MA : Brooks/Cole, Cengage Learning, 2013.

ONLINE MATERIALS

- www.math.ust.hk/~machas/numerical-methods.pdf
- http://staffhome.ecm.uwa.edu.au/~00028221/units/3A2/Notes.pdf
- http://jupiter.math.nctu.edu.tw/~smchang/9602/NA_lecture_note.pdf
- http://nm.mathforcollege.com/#sthash.f7P3VTHg.GxfdKEM9.dpbs

Noted by:



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