University of Moratuwa, Faculty of Engineering, Department of Mathematics-20170816
BSc Engineering Honors Degree
Batch 16-Semester 2(**697**)-2017/08/14:2017/11/24-14 weeks
Reading Week-2017/09/29:2017/10/09
BM(15)+EE(100)+EN(101)-(**216**)Wed-14.15:15.15-NA2
CE(126)+CH(80)+MT(50)+TT(58)-(**314**)Wed-15.15:16.15-NA1
ME(120)+ER(47)-(**167**)Thu-13.15:14.15-NA1

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Module Code	**MA1023** Part C	**Title**	**Methods of Mathematics** Numerical Methods			
Credits	**01**	**Hours/ Week**	**Lectures**	**01**	**Prerequisites**	**MA1013**
			Lab/Tutorial	**1/3**		

Learning Outcomes

At the end of this module the student should be able to

- Solve initial value problems involving second order linear ordinary differential equations.
- Application of multivariate calculus to solve simple engineering problems.

Outline Syllabus

Numerical Methods

- Algorithms and errors;
- Numerical solution of non-linear equations. Bisection and false position methods, simple iterations. Newton-Raphson method;
- Estimation of errors and acceleration of convergence. Approximations of functions.
- Numerical integration; Trapezoidal rule, Simpson's rule.

Detailed Syllabus

- **Intermediate value theorem, Mean value theorem, Taylor series with remainders.**
- **Cauchy sequences, Completeness, Banach fixed point theorem.**
- **Numerical root finding: Bisection, Iterative and Newton's methods, Error estimates.**
- **Interpolation: Lagrange interpolation, Least square approximation, Error estimates, Introduction to cubic splines.**
- **Numerical Integration: Trapezoidal and Simpson's methods, Error estimates**
- **Numerical optimization: Steepest descent method**
- **Numerical solution to ODE: Euler's method.**

Method of Assessment (for the whole course MA1023)

- End of semester examination: 2 hour closed book paper: 70%
- Mid semester examination:1 hour open book paper: 15% (on 2017/10/12 from 5.00-6.00pm)
- Spot Tests in Tute classes: 10%
- Spot Tests in Lectures: 5%

References

- *Numerical Methods for Scientific and Engineering Computation,* M.K. Kain, S.R.K. Iyenger, R.K. Jain
- *Classical and Modern Numerical Analysis, A.S. Ackleh, E.J. Allen, R.B. Hearfott, P. Seshaiyer*.
- *Numerical Analysis*, F. Scheid.
- *Numerical Analysis*: Mathematics of Scientific Computing, D. Kincaid, W. Cheney.
- *Numerical Recipes in C++, W.H. Press, S.A. Teukosky, W.T. Vetterling, B.P. Flannery.*
- *Mathematical Analysis,* Tom M. Apostol
- *Calculus*-Volume1 and 2, Tom M. Apostol
- *Advanced Calculus,* David V. Widder