

Course Outline and References

Course Code/Title JEE 606: Mathematical Techniques: 3 credits
Division: ENERGY **Semester: 1**
Prerequisite: None
Lecturer: Assoc. Prof. Dr. Prungchan Wongwises
 Assoc. Prof. Dr. Chumnong Sorapipattana
Contact address: JGSEE
E-Mail address: Prungchan.won@kmutt.ac.th , mobile: 0891178495

Course description:

Numerical solution of ordinary differential equations, difference methods of initial and boundary value problems. Numerical solutions of partial differential equations. Optimization techniques: Lagrange multiplier method, linear programming. Simplex method. Nonlinear programming, steepest-descent method, Newton method, Conjugate gradient method. Statistical and error analysis, regression.

Subject outlines:

Part: Assoc. Prof. Dr. Prungchan Wongwises

	Hrs.
1. Introduction to differential equations (ODE), Euler's method, Heun's method Runge-Kutta method.	3
2. Boundary value problems for ordinary differential equations, finite-difference Methods, derivative boundary condition.	3
3. Solving system of linear equations, Gaussian elimination, Gauss-Jordan elimination,	3
4. Eigenvalue problems, eigenvalue, eigenvector, power method	3
5. Introduction to partial differential equations (PDE), boundary and initial conditions, finite-difference methods.	3
6. Elliptic PDE, regular boundaries, irregular boundaries	3
7. Heat equation: Parabolic PDE, Wave equation: Hyperbolic PDE	3
8. Optimization techniques, classical optimization techniques, Hessian matrix Lagrange multiplier method	3
9. Linear programming. Simplex method	3
10. Nonlinear programming, steepest descent method, Newton method, Conjugate gradient method	3

Part: Assoc. Prof. Dr. Chumnong Sorapipattana

11-15. Statistical and error analysis, Regression 15

Total **45 hours**

References/Textbooks

1. John H. Mathews: Numerical Methods for Computer Science, Engineering and Mathematics, Prentice-hall Inc. (QA 297, M439)
2. James L. Buchanan, Peter R. Turner: Numerical Methods and analysis, McGraw-Hill Inc. (QA 297, B918)
3. N.S. Asaithambi : Numerical Analysis: Theory and Practice, Saunder College Publishing. (QA 297, A789)
4. Chung-Yau Lam: Applied Numerical Methods for Partial Differential Equations, Prentice-Hall. (QA 297, L213)
5. Shoichiro Nakamura: Applied Numerical Methods with Software, Prentice-Hall. (QA 297, N163)
6. Richard L. Burden, J.Douglas Faires, Numerical Analysis, ITP An International Thomson Publishing Company. (QA 297, B 947)
7. Sidney Yakowitz, Farung Szidarovszky: An Introduction to Numerical Computations, Macmillan Publishing Company. (QA 297, Y15)
8. Peter R. Turner: Guide to Scientific Computing, Macmillan. (QA 297,T951)
9. Francis Scheid, Schaum's Outline of Theory and Problems of Numerical Analysis 2/ed. (QA 297,S 318)
10. Gerald Wheatley: Applied Numerical Analysis, International Edition 2004. (QA 297, G 354)
11. S.S. Rao: Optimization, Theory and Applications, AWiley Interscience Publication,
12. Douglas C. Montgomery,George C.Runger: Applied Statistic and Probability for Engineer, John- Wiley & Sons Inc. (QA 297, M787)
13. Ajitc Tamhane, Dorothy D. Dunlop:Statistics and Data Analysis from Elementary to Intermediate. (QA 297, T157)

Approved by.

(Assoc. Prof. Dr. Prungchan Wongwises)

(Assoc. Prof. Dr. Chumnong Sorapipattana)