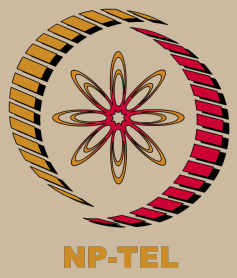
Numerical methods and programing - Video course



NPTEL

http://nptel.ac.in

Basic courses(Sem 1 and 2)

Coordinators:

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I. Numerical Analysis
Approximations and round off errors, Truncation errors and Taylor Series, Determination of roots of polynomials and transcendental equations by Newton-Raphson, Secant and Bairstow's method.
Solutions of linear simultaneous linear algebraic equations by Gauss Elimination and Gauss- Siedel iteration methods.
Curve fitting- linear and nonlinear regression analysis.
Backward, Forward and Central difference relations and their uses in Numerical differentiation and integration, Application t of difference relations in the solution of partial differential equations.
Numerical solution of ordinary differential equations by Euler, Modified Euler, Runge-Kutta and Predictor-Corrector method.
II. Computer Programming
Introduction to computer programming in C and C++ languages. Arithmetic expressions, Simple programs. The emphasis should be more on programming techniques rather than the language itself. The C programming language is being chosen mainly because of the availability of the compilers, books and other reference materials.
Example of some simple C program. Dissection of the program line by line.
Concepts of variables, program statements and function calls from the library (printf for example)
C data types, int, char, float etc.
C expressions, arithmetic operations, relational and logic operations.
C assignment statements, extension of assignment to the operations. C primitive input output using getchar and putchar, exposure to the scant and printf functions.
C statements, conditional execution using if, else. Optionally switch and break statements may be mentioned.
Concepts of loops, example of loops in C using for, while and do-while.
Optionally continue may be mentioned.
One dimensional arrays and example of iterative programs using arrays, 2-d arrays. Use in matrix computations.
Concept of Sub-programming, functions. Example of functions. Argument passing mainly for the simple variables.
Pointers, relationship between arrays and pointers. Argument passing using pointers.
Array of pointers, Passing arrays as arguments.
Strings and C string library.
Structure and unions. Defining C structures, passing structures as arguments.
Program examples.
File I/O. Use of fopen, fscanf and fprintf routines.
Lab
Development of computer program for
• Numerical integration by Trapezoidal and Simpson's rule.
• Gauss-Siedel iteration method
• Various matrix operation-and their use as sub-routines
Suggested Text Books & References.
• *Shastry, S.S., "Numerical Methods", Prentice Hall Inc., India, 1998.*
• *Noble Ben, "Numerical Methods", New York International Publications, New York, 1964.*
• *Stanton Ralph G., "Numerical Methods for Engineering", Englewood cliffs, N.J., Prentice Hall Inc., 1961.*
• *Buckingham R.A., "Numerical Methods", Sir Isaac Pitman Sons. Ltd., London, 1957.*
• *Bakhvalov, N .S., "Numerical Methods", Mir. Pub., Moscow, 1977.*
• *Grewal, B.S., "Numerical Methods", Khanna Pub., New Delhi, 1998.*
• *Sudhit Kaicker, "The Complete ANSI C", BPB Publications, New Delhi, 1996.*
• *Kernighan, B. W. and D .M. Ritchie, "The C Programming Language", Prentice Hall of India, 1998.*
• *Byron, S. Gottfreid, "Programming with C", Tata McGraw Hill, 2nd edition 1998.*