

COURSE TEMPLATE

1.	Department/Centre proposing the course	Mathematics
2.	Course Title (<i>< 45 characters</i>)	NUMERICAL METHODS AND COMPUTATIONS
3.	L-T-P structure	3-1-0
4.	Credits	4
5.	Course number	MAL 230
6.	Status (<i>category for program</i>)	Core for students of B.Tech in Maths and Computing - Program-Linked BS course for other depts.
7.	Pre-requisites (<i>course no./title</i>)	MAL110 and MAL120
8.	Status vis-à-vis other courses (<i>give course number/title</i>)	
8.1	Overlap with any UG/PG course of the Dept./Centre	
8.2	Overlap with any UG/PG course of other Dept./Centre	
8.3	Supersedes any existing course	
9.	Not allowed for (<i>indicate program names</i>)	
10.	Frequency of offering	☐ Every sem ☐ 1 st sem ☐ 2 nd sem ☒ Either sem
11.	Faculty who will teach the course Dr. S.C.S.Rao, Dr. V.V.K. Srinivas Kumar, Dr. Mani Mehra, Dr. Harish Kumar, Dr. N. Shravan Kumar	
12.	Will the course require any visiting faculty?	No
13.	Course objective (<i>about 50 words</i>): To introduce basic numerical methods, error analysis techniques and computer implementation of these methods using MATLAB.	
14.	Course contents (<i>about 100 words</i>) (<i>Include laboratory/design activities</i>): Errors in computation. Roots of nonlinear equation in one variable: Direct and iterative methods, order of convergence. Iterative methods for roots of nonlinear system of equations. Linear systems of equations: Direct and iterative methods, rate of convergence of iterative methods, Condition number and ill-conditioned systems. Interpolation: Lagrange, Newton divided difference formula, Newton's interpolations, errors in interpolation. Approximation: least square and uniform approximations. Differentiation: differentiation using interpolation formulas. Integration using interpolation: Newton-Cotes formulas, Gauss quadrature rules. Ordinary differential equations: Taylor, Euler and Runge-Kutta methods. Computer implementation of the methods in MATLAB.	

15. Lecture Outline (with topics and number of lectures)

Module no.	Topic	No. of hours
		2
1	Errors in computation.	3
2	Roots of nonlinear equation in one variable: direct and iterative methods, order of convergence.	4
3	Iterative methods for roots of nonlinear systems of equations.	4
4	Linear systems of equations direct and iterative methods.	4
5	Rate of convergence of iterative methods.	3
6	Condition number and ill- conditioned of systems.	4
7	Interpolation: Lagrange, Newton divided difference formula, Newton's interpolations.	2
8	Errors in interpolation.	4
9	Approximation: least square and uniform approximations.	4
10	Differentiation: differentiation using interpolation formulas.	4
11	Integration using interpolation: Newton-Cotes formulas, Gauss quadrature rules.	4
12	Ordinary differential equations: Taylor, Euler and Runge-Kutta methods.	42
COURSE TOTAL (14 times 'L')		

16. Brief description of tutorial activities

Tutorials will include both theoretical analysis of the numerical methods and their implementation in computer to solve real life problems.

17. Brief description of laboratory activities

Module no.	Experiment description	No. of hours
1	No Labs.	
2		
3		
4		
5		
6		
7		
8		
9		
10		
COURSE TOTAL (14 times 'P')		

18. Suggested texts and reference materials

STYLE: Author name and initials, Title, Edition, Publisher, Year.

1. Elementary Numerical Analysis: Algorithmic Approach, Samuel D. Conte, Boor.
2. Numerical Analysis (9th Ed.), Richard L. Burden, J. Douglas Faires, 2011.
3. Numerical Mathematics (2nd Ed.), Alfio Quarteroni, Riccardo Sacco, Fausto Saleri, Springer, 2007.
4. Numerical Methods for Engineers (5th Ed.), S.C. Chapra, R.P. Canale, McGraw Hill, 2007.

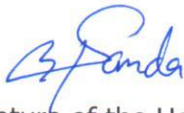
19. Resources required for the course (*itemized & student access requirements, if any*)

19.1	Software	MATLAB
19.2	Hardware	Nil
19.3	Teaching aides (videos, etc.)	Nil
19.4	Laboratory	Nil
19.5	Equipment	Nil
19.6	Classroom infrastructure	Projector.
19.7	Site visits	Nil

20. Design content of the course (*Percent of student time with examples, if possible*)

20.1	Design-type problems	Nil
20.2	Open-ended problems	Nil
20.3	Project-type activity	Nil
20.4	Open-ended laboratory work	Nil
20.5	Others (please specify)	Nil

Date: 28th February, 2013


 (Signature of the Head of the Department)