

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 - 0 - 0
4.	Credits	3
5.	Course number	MAL 107
6.	Status (<i>category for program</i>)	DC for Maths and PLC for Others

7.	Pre-requisites (course no./title)	NIL
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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	MAL 524
8.2	Overlap with any UG/PG course of other Dept./Centre	CSL 361
8.3	Supercedes any existing course	MAL 230

9.	Not allowed for (indicate program names)	NIL
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10.	Frequency of offering	☐ Every sem ☐ 1 st sem ☐ 2 nd sem ☒ Either sem
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11.	Faculty who will teach the course S.C.S.Rao, V.V.K. Srinivas Kumar, Mani Mehra, Harish Kumar, 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 and its error analysis useful for scientific computations.	
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14.	Course contents (<i>about 100 words</i>) (<i>Include laboratory/design activities</i>): Errors in computation: source and types of errors, error propagation. computer representation of numbers: floating point representation, rounding error and floating point arithmetic. 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,	
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	Gauss quadrature rules. Ordinary differential equations: Taylor, Euler and Runge-Kutta methods. Implementation of these methods.
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15. Lecture Outline *(with topics and number of lectures)*

Module no.	Topic	No. of hours
1	Errors: sources and types of errors, error propagation Computer representation of numbers: floating point representation, rounding error and floating point arithmetic.	2
2	Roots of nonlinear equation in one variable: direct and iterative methods, order of convergence.	3
3	Iterative methods for roots of nonlinear systems of equations.	3
4	Linear systems of equations direct and iterative methods.	3
5	Rate of convergence of iterative methods,	3
6	Condition number and ill- conditioned of systems.	3
7	Interpolation: Lagrange, Newton divided difference formula, Newton's interpolations.Errors in interpolation.	4
8	Approximation: least square and uniform approximations.	4
9	Differentiation: differentiation using interpolation formulas.	3
10	Integration using interpolation: Newton-Cotes formulas, Gauss quadrature rules.	4
11	Ordinary differential equations: Taylor, Euler and Runge-Kutta methods.	4
12	Problems outlined in the lectures will be solved during the Tutorial sessions.	6
COURSE TOTAL (14 times 'L')		42

16. Brief description of tutorial activities

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17. Brief description of laboratory activities

Module no.	Experiment description	No. of hours
1		
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 Methods for Engineers (5th Ed.), S.C. Chapra, R.P. Canale, McGraw Hill, 2007.
4. Elementary Numerical Analysis (3e) K. Atkinson, W. Han wiley India, 2004.

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

19.1	Software	NIL
19.2	Hardware	NIL
19.3	Teaching aides (videos, etc.)	NIL
19.4	Laboratory	NIL
19.5	Equipment	NIL
19.6	Classroom infrastructure	Projector, black board.
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: 3-1-2014

(Signature of the Head of the Department)