

COURSE TEMPLATE

1.	Department/Centre proposing the course	Mathematics
2.	Course Title (<i>< 45 characters</i>)	DIFFERENTIAL EQUATIONS
3.	L-T-P structure	3-1-0
4.	Credits	4
5.	Course number	MAL235
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>)	MAL 110, 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	15% with MAL 517, 10% with MAL 630
8.2	Overlap with any UG/PG course of other Dept./Centre	No
8.3	Supercedes any existing course	No
9.	Not allowed for (<i>indicate program names</i>)	NiL
10.	Frequency of offering	☐ Every sem ☐ 1 st sem ☐ 2 nd sem ☒ Either sem
11.	Faculty who will teach the course S.C.S. Rao, K Sreenadh, V.V.K Srinivas Kumar, Harish Kumar	
12.	Will the course require any visiting faculty?	no
13.	Course objective (<i>about 50 words</i>): To introduce the basic concepts of well-posedness, stability and qualitative properties of solutions of initial and boundary value problems. Strength of these concepts in engineering and real world problems will be highlighted.	
14.	Course contents (<i>about 100 words</i>) (<i>Include laboratory/design activities</i>): Systems of differential equations, fundamental matrix, Existence and uniqueness theorems for initial value problems, Gronwall's inequality, continuous dependence and well-posedness of initial value problems. Comparison theorems of Sturm, Sturm-Liouville eigenvalue problems, existence of eigenvalues, eigenfunctions and qualitative properties. Phase-plane analysis, Linear and Non-linear stability, Liapunov functions and applications First order Partial differential equations, Method of characteristics, local and	

	global solutions, envelop of solutions, complete and general solutions. Methods for solving second order equations, Maximum principles for Heat and Laplace equations, Greens functions, Duhamels principle.
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15. Lecture Outline (with topics and number of lectures)

Module no.	Topic	No. of hours
1	Systems of differential equations, fundamental matrix.	4
2	Existence and uniqueness theorems, Grownwalls inequality, uniqueness and well-posed ness of initial value problems.	4
3	Comparison theorems of Sturms, Sturm-Liouville eigenvalue problems, existence of eigenvalues, eigenfunctions and some qualitative properties Phase-plane analysis, Linear and Non-linear stability, Liapunov functions and applications.	5
4	Phase-plane analysis, Linear stability	5
5	Nolinear stability, Liapunov functions and applications	5
6	First order Partial differential equations, envelop of solutions, complete and general solutions.	4
7	Method of characteristics for linear and semilinear first order PDE, local and global solutions.	4
8	Methods for solving second order equations, Maximum priciples for Heat and Laplace equations, Greens functions, Duhamels principle.	4
9	Maximum priciples for Heat and Laplace equations	4
10	Greens functions, Duhamels principle.	3
11		
12		
COURSE TOTAL (14 times 'L')		42

16. Brief description of tutorial activities

Tutorial problems will be designed to cover theoretical concepts and some engineering or real-life problems.

17. Brief description of laboratory activities

Module no.	Experiment description	No. of hours
1	Nil	
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. G.F.Simmons, Differential equations with applications and historical notes, Mc Graw Hill.
2. R.C.McOwen, Partial Differential Equations: Methods and Applications, Printice Hall.

3.L.C. Evans, Partial Differential Equations: Second Edition (Graduate Studies in Mathematic), AMS

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	Nil
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)