

COURSE TEMPLATE

1.	Department /Centre proposing the course	MATHEMATICS
2.	Course Title (<i>< 45 characters</i>)	DIFFERENTIAL EQUATIONS
3.	L-T-P structure	3 - 0 - 0
4.	Credits	3
5.	Course number	MAL 102
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 260
8.2	Overlap with any UG/PG course of other Dept./Centre	NIL
8.3	Supercedes any existing course	NIL

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 Harish Kumar, VVK Srinivas Kumar, Mani Mehra, SCS Rao, K.Sreenadh	
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 of Ordinary and Partial Differential equations. Strength of these concepts in engineering and real world problems will be highlighted.	
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14.	Course contents (<i>about 100 words</i>) (<i>Include laboratory/design activities</i>): Systems of differential equations, Existence and uniqueness theorems for initial value problems of semilinear and nonlinear ODEs, continuous dependence and well-posedness; Comparison theorems of Sturm, Sturm-Liouville eigenvalue problems; Phase-plane analysis, Linear and Non-linear stability, Liapunov functions and applications; First order Partial differential equations, Method of characteristics, local and global solutions, envelope of solutions, complete and general solutions; Second order equations: Heat and Wave equation, fundamental solutions, method of eigenfunctions, Duhamel's principle. Maximum principles for Heat and Laplace equation, Green's functions.	
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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.	4
4	Phase-plane analysis, Linear stability.	4
5	Nolinear stability, Liapunov functions and applications.	4
6	First order Partial differential equations, envelop of solutions, complete and general solutions.	2
7	Method of characteristics for linear and semilinear first order PDE	3
8	Methods for solving second order equations, heat and wave equations in one variable, heat kernals and elementary solutions	4
9	D'Alembert's formula, weak solutions, Duhamels principle.	3
10	Maximum priciples and Green's functions for Heat and Laplace equations	4
11	Problems solving sessions outlined in the lecture classes	6
12		
COURSE TOTAL (14 times 'L')		42

16. Brief description of tutorial activities

NA

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.G.F.Simmons, Differential equations with applications and historical notes, Tata Mc Graw Hill, 2011
2. R.C.McOwen, Partial Differential Equations: Methods and Applications, Printice Hall, 2004
- 3.L.C. Evans, Partial Differential Equations: Second Edition (Graduate Studies in

Mathematic), AMS, 2002

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	Microphone, Blackboard and 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	10%
20.4	Open-ended laboratory work	Nil
20.5	Others (please specify)	Nil

Date: 3-1-2014

(Signature of the Head of the Department)