NPTEL Syllabus Template

Course Title	Wavelets and Applications
Discipline	Mathematics
Duration of course 4/8/12 weeks (10/20/30 hours @2.5 hrs/week)	12 weeks
Number of times you have taught this course totally and in the last 5 years (2-3 times is preferable, if not more)	Total : 7 times, Twice in the last five years
Is this course syllabus approved by AICTE or by Senate in your/any institute? If yes, please give the course name and institute under which this is approved.	Yes, approved by the senate of IIT Hyderabad
The time frame of when you would want to offer the course: (Jan 2024/July 2024)	July 2024
Will it map to any course in the AICTE model curriculum? **LINK to AICTE Curriculum** LINK 1 LINK 2 LINK 3 LINK 4	Yes, the proposed course has some overlap with ECEL12.
Will it map onto any of the NPTEL domain? **LINK to Domain page:** https://nptel.ac.in/noc/Domain/	It can partially map onto the following course: https://nptel.ac.in/courses/108101093 But the orientation and perspective of the proposed course are different.

Name of the Instructor(s)	C S Sastry	
Department	Mathematics	
Institute	Indian Institute of Technology, Hyderabad	
Email ID	csastry@math.iith.ac.in	
Mobile Phone Number	99 631 28 002	
Website of Instructor	https://people.iith.ac.in/csastry/index.html	

Intended audience	Senior UG, M.Sc(Mathematics), M.Tech/PhD (Communication and Computer Science) students
Is it a core/elective course?	Elective
Is it a UG/PG/PhD level course?	Senior UG/PG/PhD
Is this course relevant for GATE exam preparation?	No
Which degrees would it apply to? (BE/ME/MS/BSc/MSc/PhD etc)	M.Sc, ME/M.Tech, PhD
What are the next set of courses that can be taken by students who complete this?	Courses related to Signal processing, Image processing
Pre-requisites in terms of educational qualification of participants, or if any other courses should be done before this course can be taken	Basic functional analysis
Industry recognition of this course – List of companies/industry that will recognize/value this online course	Nil
Will the final certification exam be– paper/pen type or computer based - both are proctored	Computer based
Will the course require use of any software such as MATLAB or any programming language, etc. or any other tool? If yes, does it have a Linux based compiler available or if licensed, can we get the educational license for the same?	No
Names of 2 reviewers for the course (can be from other institutes – will be used if we need any additional inputs on the course) – Name, Dept, email id, Institute	Name : Prof. Mani Mehra Dept. : Mathematics Institute : IIT Delhi Email : mmehra@maths.iitd.ac.in Name : Prof. Biswaranjan Behera Dept. : Mathematics Institute : Indian Statistical Institute, Calcutta Email : biswa@isical.ac.in
List of reference materials/books	1. I. Daubechies, "Ten lectures on wavelets", SIAM 1992. 2. C. Chui, "An introduction to wavelets," Academic Press, 2014. 3. E. Hernandez and G. Weiss, "A first course on wavelets," CRC Press, 1996.

FOR GETTING THE INTRODUCTORY COURSE PAGE READY – TO OPEN FOR ENROLLMENTS

1. Introduce the course in about 4-5 lines

Wavelets are localized and oscillatory functions that generate bases for several function spaces. The multiresolution framework, meant for constructing wavelets, possesses attractive numerical properties for executing the wavelet decomposition of a function. The course aims at discussing orthogonal/non-orthogonal wavelet bases constructed for the space of square integrable functions. It then discusses the algorithmic as well as the application of discrete wavelets.

2. Photograph of instructor(s)

3. About the instructor(s)

C. S. Sastry received the Ph.D. degree in Mathematics from the Indian Institute of Technology Kanpur, Kanpur, India, working under the guidance of Prof. P. C. Das. He is currently serving as a professor in the Department of Mathematics, Indian Institute of Technology, Hyderabad. Prior to joining IIT Hyderabad, he gained professional experience at University of British Columbia, Vancouver, Canada and IIITDM Jabalpur.

His research interests include Wavelets, Inverse Problems, and Sparse Optimization Theory. In particular, he is interested in the interdisciplinary applications of mathematical methods to the inverse problems that arise in medical image processing.

4. An introductory video about the course (2-5 minutes' duration)

Weekly Course Plan			
Weeks		Lecture Names	Assignments
Week 1	:	Review of normed linear spaces and Fourier transform	Online
Week 2	:	Continuous wavelet transform	Online
Week 3	:	Discrete wavelets and Frames-I	Online
Week 4	:	Discrete wavelets and Frames-II	Online
Week 5	:	Riesz bases	Online
Week 6	:	Multiresolution Analysis	Online
Week 7	:	Construction of orthogonal wavelets-I	Online
Week 8	:	Construction of orthogonal wavelets-II	Online
Week 9		Construction of orthogonal wavelets-III	Online
Week 10		Decomposition and reconstruction algorithms	Online
Week 11		Non-Orthogonal wavelets	Online
Week 12		2D Wavelets and applications	Online

TA Details			
	:	Teaching Assistant 1	Teaching Assistant 2
Name	:	Akash Sen	Shantam Gulati
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Currently pursuing degree	:	PhD	PhD