

TEACHING PLAN

Course Title: Applied Fourier Analysis	Duration of Examination: 3 hours
Course Code: MAMT--304	Maximum Marks: 100
Course Instructor: Prof. S. D. Sharma	

Unit I

LECTURE 1	Introduction to Applied Fourier Analysis, review of measure theory
LECTURE 2	Fourier Series, Fourier Sine series and Fourier Cosine serie
TUTORIAL 1	Exercises related to Lecture 1 and Lecture 2
LECTURE 3	Smoothness, the Riemann-Lebesgue Lemma
LECTURE 4	The Dirichlet and the Fourier kernels, Area under Dirichlet kernel on $[0, \pi]$
TUTORIAL 2	Examples and exercises related to Lecture 3 and Lecture 4
LECTURE 5	The Riemann-Lebesgue property of the Dirichlet kernel
LECTURE 6	Continuous and Discrete Fourier kernel, pointwise Convergence of Fourier series
TUTORIAL 3	Examples and Exercises related to Lecture 5 and Lecture 6
LECTURE 7	Criterion for pointwise convergence
LECTURE 8	Riemann's-Localization principle, Dini's test , Lipschitz's test
TUTORIAL 4	Exercises related to Lecture 7 and Lecture 8

Unit II

LECTURE 9	Pointwise convergence of Fourier Series, Selector property of $[\sin(n + 12 u/u)]$
LECTURE 10	Dirichlet pointwise convergence theorem
TUTORIAL 5	Exercises and examples related to Lecture 9 and Lecture 10
LECTURE 11	The Gregory series, Selector property of $\sin w$, pointwise convergence for boundary value
LECTURE 12	Uniformly convergent trigonometric series and Fourier series
TUTORIAL 6	Exercises and examples related to Lecture 11 and Lecture 12
LECTURE 13	Absolutely convergent coefficients
LECTURE 14	Uniform convergence for piecewise smooth functions.
TUTORIAL 7	Exercise related to Lecture 13 and Lecture 14
LECTURE 15	The Gibb's phenomenon
LECTURE 16	The Gibb's phenomenon for a step function, Divergent Fourier series
TUTORIAL 8	Exercises related to Lecture 15 and Lecture 16

Unit III

LECTURE 17	Termwise intergation and termwise differentiation, Trigonometric vs. Fourier series
LECTURE 18	Smoothness and speed of convergence, Dido's Lemma
TUTORIAL 9	Examples and exercises related to Lecture 17 and Lecture 18
LECTURE 19	Other kinds of summability, Toeplitz summability
LECTURE 20	Abel summability, Fejer Kernel, properties of Fejer Kernels, Fejer's Theorem
TUTORIAL 10	Examples and exercises related to Lecture 19 and Lecture 20
LECTURE 21	A-summability of Fourier series
LECTURE 22	Hardy-Landu Theorem
TUTORIAL 11	Examples and exercises related to Lecture 21 and Lecture 22
LECTURE 23	the smoothing effect of $(C, 1)$ summation
LECTURE 24	Lebesgue point convergence Theorem

TUTORIAL 12	Examples and exercises related to Lecture 23 and Lecture 24
Unit IV	
LECTURE 25	The finite Fourier transform
LECTURE 26	Convolution on the circle group T , the exponential form of Lebesgue theorem,
TUTORIAL 13	Examples and exercises related to Lecture 25 and Lecture 26
LECTURE 27	The Fourier transform and residue
LECTURE 28	The Fourier map
TUTORIAL 14	Examples and exercises related to Lecture 27 and Lecture 28
LECTURE 29	Convolution on R
LECTURE 30	Inversion, Exponential form
TUTORIAL 15	Examples and exercises related to Lecture 29 and Lecture 30
LECTURE 31	Trigonometric form
LECTURE 32	$(C, 1)$ summability for integrals
TUTORIAL 16	Examples and exercises related to Lecture 31 and Lecture 32
Unit V	
LECTURE 33	The Fejer Lebesgue inversion theorem
LECTURE 34	Convergence Assistance, Approximate identity
TUTORIAL 17	Examples and exercises related to Lecture 33 and Lecture 34
LECTURE 35	Transforms of derivative and integrals
LECTURE 36	Fourier sine and cosine transforms
TUTORIAL 18	Examples and exercises related to Lecture 35 and Lecture 36
LECTURE 37	Parseval's identities
LECTURE 38	the L_2 theory
TUTORIAL 19	Examples and exercises related to Lecture 37 and Lecture 38
LECTURE 39	The Plancherel Theorem
LECTURE 40	Continue Lecture 39
TUTORIAL 20	Examples and exercises related to Lecture 39 and Lecture 40
Total Lectures: 40	Total Tutorials: 20
Total = 60	

Textbooks:

1. George Bachman, Lawrence Narici and Edward Beckenstein, Fourier and Wavelet Analysis, Springer-Verlag, New-York, 2005.

Reference books:

1. C S Rees, S M Shah, C V Stanojevic: Theory and applications of Fourier Analysis, Marcel Dekkar Inc., New York
2. Rajendra Bhatia, Fourier Series, Hindustan Book Agency, Delhi.
3. N. K. Bary, A Treatise on Trigonometric Series, Pergamon Press., A. Zygmund, Trigonometric Series, Cambridge Press.
4. H P Hsu, H B Jovanovich, Applied Fourier Analysis, New York.
5. K G Beauchamp, Walsh Functions and their applications, Academic Press.
6. E O Brigham, The Fast Fourier Transform, Prentice Hall of India.