TEACHING-LEARNING CONTRACT
LEARNING PROGRAM OUTLINE
LEARNING UNIT PROGRAM

ELECTIVE COURSE I (WAVELET)
PAS 141

STATISTICS STUDY PROGRAM OF MATHEMATICS DEPARTMENT
MATHEMATICS AND SCIENCE FACULTY
DIPONEGORO UNIVERSITY
SEMARANG
2007

LEARNING UNIT PROGRAM

Course Title	:	**Elective Course I (Wavelet)**
Code/Credit	:	**PAS 141/3**
Duration	:	**2 x 150 minutes**
Meeting in sequence	:	**1 and 2**

A. Instruction Aim

1. General : After studying this course, students are expected be able to explain about wavelet function properties and its application in statistics.

2. Specific : After studying this chapter students are expected be able to explain about orthogonal series

B. Subject : orthogonal series

C. Sub Subject : Orthogonal Bases, Orthonormal Bases, Complete Orthonormall System , Fourier series, Discrete Fourier Transform

D. Learning Activities

Stage	Lecturer Activities	Students Activities	Learning Tools Media
Introduction	1. Explaining about learning contract 2. Explaining about general aim of learning and specific aim of learning 3. Explaining the studying scoop in the first and second meeting. 4. Giving motivation about impotence of this subject that can be used to prove some others.	Observing and taking notes	OHP, board, and reference

Presentation	Explaining about orthogonal bases, orthonormal bases, CONS, orthogonal series, Fourier series, and some examples.	Observing, taking notes, discussion, and doing exercises.	OHP, board, and reference
Closure	1. Giving some personal exercises problem for evaluation 2. Giving summary of learning and introduce the next meeting.	Observing and taking notes	OHP, board, and reference

E. Evaluation : Students competent measured by giving some individual home work exercises.

F. Reference :

[1]. Ogden, R.T., Essential Wavelets for Statistical Applications and Data Analysis, 1997, Birkhauser, Boston

[2]. Bruce, A and Gao, Hong-Ye, Applied wavelet Analysis with S-PLUS, 1996, Springer, New York

LEARNING UNIT PROGRAM

Course Title	:	**Elective Course I (Wavelet)**
Code/Credit	:	**PAS 141/3**
Duration	:	**150 minutes**
Meeting in sequence	:	**3**

A. Instruction Aim

1. General : After studying this course, students are expected be able to explain about wavelet function properties and its application in statistics.
2. Specific : After studying this chapter, students are expected be able to explain about wavelet function and its properties

B. Subject : Wavelet function

C. Sub Subject : Wavelet function, wavelet function properties, kinds of wavelet function

E. Learning Activities

Stage	Lecturer Activities	Students Activities	Learning Tools Media
Introduction	1. Explaining specific instruction aim. 2. Explaining the studying scoop of 3^{rd} meeting 3. Giving motivation about impotence of this subject that can be used to prove some others..	Observing and taking notes	OHP, board, and reference
Presentation	1. Explaining definition of wavelet, properties, and kinds.	Observing, taking notes, discussion, and doing	OHP, board, personal computer, and

	2. Explaining to visualize wavelet by computer software.	exercises.	reference
Closure	1. Giving some personal exercises problem for evaluation 2. Giving summary of learning and introduce the next meeting.	Observing and taking notes	OHP, board, and reference

E. Evaluation : Students competent measured by giving some individual home work exercises.

F. Reference :

[1]. Ogden, R.T., Essential Wavelets for Statistical Applications and Data Analysis, 1997, Birkhauser, Boston

[2]. Bruce, A and Gao, Hong-Ye, Applied wavelet Analysis with S-PLUS, 1996, Springer, New York

LEARNING UNIT PROGRAM

Course Title	:	**Elective Course I (Wavelet)**
Code/Credit	:	**PAS 141/3**
Duration	:	**2 x 150 minutes**
Meeting in sequence	:	**4 and 5**

A. Instruction Aim

1. General : After studying this course, students are expected be able to explain about wavelet function properties and its application in statistics.
2. Specific : After studying this chapter, students are expected be able to explain about multi resolution analysis and wavelet transformation.

B. Subject : multi resolution analysis and wavelet transformation

C. Sub Subject : Haar system, Multi resolution analysis, kinds of wavelet, continues wavelet transform, discrete wavelet transform.

F. Learning Activities

Stage	Lecturer Activities	Students Activities	Learning Tools Media
Introduction	1. Explaining specific instruction aim. 2. Explaining the studying scoop of 4^{th} and 5^{th} meeting 3. Giving motivation about impotence of this subject that can be used to prove some others	Observing and taking notes	OHP, board, and reference
Presentation	1. Explaining about multi	Observing, taking	OHP, board,

	resolution analyses and wavelet series. 2. Explaining about visualization of multi resolution analyses by computer software. 3. Explaining about discrete and continues wavelet transform 4. Explaining about calculation of discrete wavelet transform by computer software.	notes, discussion, and doing exercises.	personal computer, and reference
Closure	1. Giving some personal exercises problem for evaluation 2. Giving summary of learning and introduce the next meeting.	Observing and taking notes	OHP, board, and reference

E. Evaluation : Students competent measured by giving some individual home work exercises.

F. Reference :

[1]. Ogden, R.T., Essential Wavelets for Statistical Applications and Data Analysis, 1997, Birkhauser, Boston

[2]. Bruce, A and Gao, Hong-Ye, Applied wavelet Analysis with S-PLUS, 1996, Springer, New York

LEARNING UNIT PROGRAM

Course Title : **Elective Course I (Wavelet)**
Code/Credit : **PAS 141/3**
Duration : **2 x 150 minutes**
Meeting in sequence : **6 and 7**

A. Instruction Aim

1. General : After studying this course, students are expected be able to explain about wavelet function properties and its application in statistics.
2. Specific : After studying this chapter, students are expected be able to estimate density function by basic estimation

B. Subject : Basic density estimation

C. Sub Subject : Histogram estimation, kernel estimation, orthogonal series estimation

G. Learning Activity

Stage	Lecturer Activities	Students Activities	Learning Tools Media
Introduction	1. Explaining specific instruction aim. 2. Explaining the studying scoop of 6^{th} and 7^{th} meeting 3. Giving motivation about impotence of this subject that can be used to prove some others	Observing and taking notes	OHP, board, and reference

Presentation	1. Explaining about density estimation by histogram, kernel function, and orthogonal series. 2. Giving a problem example and its solutions by computer software.	Observing, taking notes, discussion, and doing exercises.	OHP, board, personal computer, and reference
Closure	1. Giving some personal exercises problem for evaluation 2. Giving summary of learning and introduce the next meeting.	Observing and taking notes	OHP, board, and reference

E. Evaluation : Students competent measured by giving some individual home work exercises.

F. Reference :

[1]. Ogden, R.T., Essential Wavelets for Statistical Applications and Data Analysis, 1997, Birkhauser, Boston

[2]. Bruce, A and Gao, Hong-Ye, Applied wavelet Analysis with S-PLUS, 1996, Springer, New York

LEARNING UNIT PROGRAM

Course Title	:	**Elective Course I (Wavelet)**
Code/Credit	:	**PAS 141/3**
Duration	:	**2 x 150 minutes**
Meeting in sequence	:	**8 and 9**

A. Instruction Aim

1. General : After studying this course, students are expected be able to explain about wavelet function properties and its application in statistics.
2. Specific : After studying this chapter, students are expected be able to estimate density function by wavelet.

B. Subject : Wavelet density estimation

C. Sub Subject : Haar wavelet estimation, smooth wavelet estimation.

H. Learning Activity

Stage	Lecturer Activities	Students Activities	Learning Tools Media
Introduction	1. Explaining specific instruction aim. 2. Explaining the studying scoop of 8^{th} and 9^{th} meeting 3. Giving motivation about impotence of this subject that can be used to prove some others	Observing and taking notes	OHP, board, and reference
Presentation	1. Explaining about density estimation by wavelet. 3. Explaining about density	Observing, taking notes, discussion, and doing	OHP, board, personal computer, and

	estimation by haar wavelet and smooth wavelet. 4. Giving a problem example and its solutions by computer software.	exercises.	reference
Closure	1. Giving some personal exercises problem for evaluation 2. Giving summary of learning and introduce the next meeting.	Observing and taking notes	OHP, board, and reference

E. Evaluation : Students competent measured by giving some individual home work exercises.

F. Reference :

[1]. Ogden, R.T., Essential Wavelets for Statistical Applications and Data Analysis, 1997, Birkhauser, Boston

[2]. Bruce, A and Gao, Hong-Ye, Applied wavelet Analysis with S-PLUS, 1996, Springer, New York

LEARNING UNIT PROGRAM

Course Title : **Elective Course I (Wavelet)**
Code/Credit : **PAS 141/3**
Duration : **2 x 150 minutes**
Meeting in sequence : **10, 11 and 12**

A. Instruction Aim

1. General : After studying this course, students are expected be able to explain about wavelet function properties and its application in statistics.
2. Specific : After studying this chapter, students are expected be able to estimate regression function by kernel method, Fourier series and wavelet method.

B. Subject : Classic regression estimator, wavelet regression estimator

C. Sub Subject : Regression estimators by kernel, Fourier series, and wavelet. Asymptotic properties of estimator.

I. Learning Activity

Stage	Lecturer Activities	Students Activities	Learning Tools Media
Introduction	1. Explaining specific instruction aim. 2. Explaining the studying scoop of 10^{th} , 11^{th} and 12^{th} meeting 3. Giving motivation about impotence of this subject that can be used to prove some others	Observing and taking notes	OHP, board, and reference

Presentation	1. Explaining about regression estimation by kernel and Fourier series. 2. Explaining about wavelet regression estimation and its asymptotic properties. 3. Explaining about wavelet regression estimation by computer software.	Observing, taking notes, discussion, and doing exercises.	OHP, board, personal computer, and reference
Closure	1. Giving some personal exercises problem for evaluation 2. Giving summary of learning and introduce the next meeting.	Observing and taking notes	OHP, board, and reference

E. Evaluation : Students competent measured by giving some individual home work exercises.

F. Reference :

[1]. Ogden, R.T., Essential Wavelets for Statistical Applications and Data Analysis, 1997, Birkhauser, Boston

[2]. Bruce, A and Gao, Hong-Ye, Applied wavelet Analysis with S-PLUS, 1996, Springer, New York

LEARNING UNIT PROGRAM

Course Title	:	**Elective Course I (Wavelet)**
Code/Credit	:	**PAS 141/3**
Duration	:	**2 x 150 minutes**
Meeting in sequence	:	**13, and 14**

A. Instruction Aim

1. General : After studying this course, students are expected be able to explain about wavelet function properties and its application in statistics.

2. Specific : After studying this chapter, students are expected be able to estimate time series model by classical method and wavelet method

B. Subject : Classical time series analyses, spectral analyses

C. Sub Subject : Autoregressive model, Moving average model, spectrum, spectral analyses

J. Learning Activity

Stage	Lecturer Activities	Students Activities	Learning Tools Media
Introduction	1. Explaining specific instruction aim. 2. Explaining the studying scoop of 13^{th} and 14^{th} meeting 3. Giving motivation about impotence of this subject that can be used to prove some others	Observing and taking notes	OHP, board, and reference
Presentation	1. Reviewing about	Observing, taking	OHP, board,

	autoregressive method, and moving average methods 2. Explaining about spectral density estimator concerning to time series data. 3. Explaining about wavelet spectral density estimation by computer software.	notes, discussion, and doing exercises.	personal computer, and reference
Closure	1. Giving some personal exercises problem for evaluation 2. Giving summary of learning and introduce the next continuity of wavelet methods.	Observing and taking notes	OHP, board, and reference

E. Evaluation : Students competent measured by giving some individual home work exercises.

F. Reference :

[1]. Ogden, R.T., Essential Wavelets for Statistical Applications and Data Analysis, 1997, Birkhauser, Boston

[2]. Bruce, A and Gao, Hong-Ye, Applied wavelet Analysis with S-PLUS, 1996, Springer, New York

TEACHING-LEARNING AGREEMENT

Course Title : Elective Course I (Wavelet)
Code : PAS 141
Credit : 3
Semester : VI

1. Course Advantage

   The contents of Elective Course 1 are the recent issues of science especially in wavelet methods. This method is a new method in nonparametric function estimation.

2. Description of Course

   The course consist a study of wavelet function properties and its superiority compared to the other methods before as well as Fourier transform method. Some application of wavelet is given, especially in statistics.

3. General Instruction Aim

   After studying this course, students are expected to be able to explain about wavelet function properties and the application in statistics.

4. Lecture Strategic

   Lecturing consist of three activity, which are classroom activity, assignment and laboratorial activity. Classroom activities consist of explaining definition, concept, and applied relevant examples. Assignments consist of individual assignment and group assignment. Laboratorial Activities consist of computation and simulation of wavelet methods.

5. Refference:

   [1]. Ogden, R.T. Essential Wavelets for Statistical Applications and Data Analysis, 1997, Birkhauser, Boston

   [2] Bruce, A and Gao, Hong-Ye, Applied wavelet Analysis with S-PLUS, 1996, Springer, New York.

6. Assignment

- Assignment will be given twice in minimal
- Mid semester evaluation is given in written with close book system. In the final of course students must presenting the work paper as final evaluation.

7. Scoring Criteria

Score criteria of achievement level are:

Grade	Point	Range
A	4	A≥3,75
AB	3,5	3,25 ≤ A B < 3,75
B	3	2,75 ≤ B< 3,25
BC	2,5	2,25≤ BC<2,75
C	2	1,75≤C< 2,25
CD	1,5	1,25≤CD<1,75
D	1	0,75≤D<1,25
E	0	E<0,75

Final point decided by three components:

Assignment	20%
Mid semester evaluation	30%
Final evaluation	50%

8. Schedule of lecturing

Meeting	Subject	References
1	Learning contract, Introduction	
2	Orthogonal series: orthogonal bases, orthonormal bases, CONS , Fourier series, Discrete Fourier Transform,	[1] 1-7

3	Wavelet function: definition, properties and kinds of wavelet.	[1] 23 [2]11-16
4	Multi resolution Analyses: Haar system, wavelet representation.	[1] 7-23 [2]27-30
5	Wavelet Transform: Continues Wavelet Transform, Discrete Wavelet Transform.	[1]107-108[[2]19-26
6	Density Estimator: histogram estimation, Kernel estimation, orthogonal series estimation.	[1] 29-35
7	Laboratorial Assignment	[2]11-16, 19-30,
8	Mid semester evaluation	
9	Wavelet density estimation, asymptotic properties	[1]49-53
10	Laboratorial Assignment	[1] 29-35, 49-53
11	Regression estimation: kernel estimation, orthogonal series estimation.	[1]38-48
12	Wavelet regression estimation: asymptotic properties	[1]54-58 [2]83-104
13	Laboratorial Assignment	[1]38-48, 54-58 [2]83-104
14	Spectrum, spectral analyses	[1]133-140 [2]105-110
15	Laboratorial Assignment	[1]133-140 [2]105-110
16	Final evaluation	

LEARNING PROGRAM OUTLINE

Subject Course Title : Elective Course 1 (Wavelet)
Code : PAS 141
Credit : 3

Short Description

Elective Course is a lecturing in recent study of science and technology development. The wavelet subject consist a study of wavelet function properties and the superiority than other methods before as well as Fourier transform method. Some application of wavelet is given, especially in statistics.

General Instruction Aim

After studying this course, students are expected to be able to explain about wavelet function properties and the application in statistics.

.

No.	Special Instruction Aim	Subject	Sub subject	Time estimation	References
1	Students are able to explain the concept of orthogonal series, after studying about orthogonal series.	orthogonal series	▪ orthogonal bases ▪ orthonormal bases ▪ CONS ▪ Fourier Series ▪ Discrete Fourier Transform	1X150 minutes	[1] 1-7
2	Students are able to explain wavelet	wavelet function	▪ wavelet function	150 minutes	[1] 23 [2]11-16

	function properties, after studying about wavelet function.		▪ wavelet properties ▪ kinds of wavelets		
3	Students are able to explain the concept of multi resolution analyses, after studying about multi resolution analyses	multi resolution analyses	▪ Haar system ▪ multi resolution analyses ▪ wavelet representation	150 minutes	[1] 7-23 [2]27-30
4.	Students are able to explain wavelet as transformation form after studying about Wavelet Transform.	Wavelet Transform	▪ Continues Wavelet Transform ▪ Discrete Wavelet Transform	150 minutes	[1]107-108[[2]19-26
5	Students are able to estimate density function after studying about density estimator.	Density Estimator	▪ histogram Estimation ▪ Kernel Estimation ▪ orthogonal series estimation	2x150 minutes	[1] 29-35,
6	Students are able to estimate density function in wavelet series form after studying about wavelet density estimator.	wavelet density estimator	▪ wavelet density estimator ▪ Asymptotic properties	2X150 minutes	[1]49-53

7	Students are able to estimate Regression function after *studying about* Regression estimation.	Regression estimation	▪ kernel estimation ▪ orthogonal series estimation	150 minutes	[1]38-48
8	Students are able to estimate Regression function in wavelet series form after studying about Wavelet Regression estimation.	Wavelet Regressions estimator.	▪ Wavelet regression estimator ▪ Asymptotic properties.	2X150 minutes	[1]54-58 [2]83-104
9	Students are able to apply wavelet series in time series analyses after studying about Spectral analyses.	Analisa Spektral	▪ Spectrum ▪ spectral analyses	2x150 minutes	[1]133-140 [2]105-110

Keterangan Sumber Kepustakaan:

[1]. Ogden, R.T., Essential Wavelets for Statistical Applications and Data Analysis, 1997, Birkhauser, Boston

[2] Bruce, A and Gao, Hong-Ye, Applied wavelet Analysis with S-PLUS, 1996, Springer, New York