GBBP & SAP
SEMESTER III dan IV

KURIKULUM
JURUSAN TEKNIK MESIN
FAKULTAS TEKNIK – UNDIP
Tahun 2007

COURSE OUTLINE

SUBJECT : ENGINEERING MATHEMATIC
SUBJECT CODE : TKM 211
SHORT DESCRIPTION : 1st Differential equation problem solving to higher orderi, simultaneous higher order differential equation, with its application and boundary condition
GENERAL OBJECTIVE : Student able to solve differential equation in mechanical engineering field, mechanical vibration, heat exchanger, refrigerator, combustion enginer, turbine, etc.

No	SPESIFIC OBJECTIVE	MAIN COURSE DESCRIPTION	SUB COURSE DESCRIPTION	TIME ESTIMATION (MENIT)	LEARNING METHOD	DESIRABLE STUDENT COMPETENCIES	TEXT BOOK RESOURCE
1	Task, problem solving	1st order DE	Variable separation w/ example	150	Presentation and task	Able to think systhematically	Ref. 1,2,3
2		1st order linear DE	Bernoulli DE, w/ application	150	Presentation and task	Able to think systhematically	Ref. 1,2,3
3		Exact DE	Using integral factor,example and quiz	150	Presentation and task	Able to think systhematically	Ref. 1,2,3
4		homogen 2nd order DE,	Homogen constant coefficient DE, example	150	Presentation and task	Able to think systhematically	Ref. 1,2,3
5		Non homogen 2nd order DE	Nonhomogen DE with twin roots	150	Presentation and task	Able to think systhematically	Ref. 1,2,3
6		linear 3rd order DE	Quiz, DE example and application	150	Presentation and task	Able to think systhematically	Ref. 1,2,3
7		linear 4th order DE	Higher order DE,example	150	Presentation and task	Able to think systhematically	Ref. 1,2,3
8	Mid-semester				Presentation and task	Able to think systhematically	Ref. 1,2,3
9		Higher order DE	Higher order DE w/ complex roots	150	Presentation and task	Able to think systhematically	Ref. 1,2,3
10		1st and 2nd order simultaneous DE	Using subtitution method, example	150	Presentation and task	Able to think systhematically	Ref. 1,2,3
11		Simultaneous 2nd order DE2	Using determinant, Quiz, example	150	Presentation and task	Able to think systhematically	Ref. 1,2,3
12		Simultanous higher order DE	Application using boundary condtion, quizz	150	Presentation and task	Able to think systhematically	Ref. 1,2,3
13		Simultanous higher order DE	Linear higher order Deproblem solving	150	Presentation and task	Able to think systhematically	Ref. 1,2,3
14		GAMMA function	Example and application	150	Presentation and task	Able to think systhematically	Ref. 1,2,3
15		BETA function	Example and application	150	Presentation and task	Able to think systhematically	Ref. 1,2,3

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Pustaka :1. Erwin Kreyzig, *Advanced Engineering Mathematics*, John Willey&Sons, New York, 1987
2. N Piskunov, *Deffrential and Calculus Vol II*, Mir Publisher, Moscow, 1980
3. Murray R Spiegel, *Advanced Mathematicsfor Engineers & Scientists*, Mc Graw Hill Book Co, New York, 1990

SATUAN ACARA PEMBELAJARAN (SAP)

JUDUL MATA KULIAH	:	Matematika Teknik I
KODE MATA KULIAH	:	TKM 211
SKS	:	3 Sks
WAKTU PERTEMUAN	:	180 menit, 2 kali seminggu
PERTEMUAN KE	:	1

A. TUJUAN INSTRUKSIONAL

1. UMUM : Mhs mampu menyelesaikan Pers Defferensial (PD) yang dijumpai pada bidang teknik mesin, getaran teknik, perpindahan panas, mekanika fluida, termodinamika, penukar kalor, mesin pendingin, motor bakar, turbin dll.

2 KHUSUS : mhs dapat memahami, menyelesaikan, tugas2 dan menentukan jawaban yang benar.

B. KEMAMPUAN SOFT SKILL : Dapat berfikir sistimatik dalam berbagai kegiatan sehari-hari dan mengambil keputusan yang tepat, sesuai dan benar

C. METODA PEMBELAJARAN : Memberi ceramah, tanya jawab, contoh penyelesaiannya

D. POKOK BAHASAN : PD orde 1

E. SUB POKOK BAHASAN : Penyelesaiaan PD orde 1 sederhana dg pemisah variable.

F. KEGIATAN BELAJAR MENGAJAR

NO	TAHAPAN	WAKTU	KEGIATAN PENGAJAR	KEGIATAN MAHASISWA	MEDIA DAN ALAT PEMBELAJARAN
1	PENDAHULUAN	10	Penjelasan umum tenteng PD	Mengikuti ceramah	Whiteboard
2	PENYAJIAN	140	Pembuktian & penyelesaian, contoh penggunaan	Mengikuti ceramah	LCD-powerpoint
3	PENUTUP	30	Tanya-jawab, kesimpulan dll	Tanya-jawab	Whiteboard

G. EVALUASI : Tugas dirumah untuk di evaluasi pada minggu berikutnya, oleh Asisten

H. KEPUSTAKAAN :

1. **Erwin Kreyzig, *Advanced Engineering Mathematics*, John Willey&Sons, New York, 1987**
2. **N Piskunov, *Deffrential and Calculus Vol II*, Mir Publisher, Moscow, 1980**
3. **Murray R Spiegel, *Advanced Mathematicsfor Engineers & Scientists*, Mc Graw Hill Book Co, New York, 1990**

STANDARD COURSE OUTLINE

Subject : 1ST **ENGINEERING MATHEMATICS**
Subject Code : TKM 211
Subject Credit : 3
Class schedule : 2 x 75 minutes
Lecture : 1st

A. Course Objective
1. General Objective : Student have the ability to solve differential equation which can be seen on mechanical engineering field, vibration technique, heat transfer, fluid mechanics, thermodynamics, heat exchanger, refrigeration, turbine, etc.
2. Specific Objective : student have the ability to understand, doing problem exercise and find the right answer

B. Desirable student competencies:
Systematical thinking in real life, and to choose the right decisions

C. Course Method:
Presentation, Question and answer, problem exercise.

D. Main course description:
1st order differential equation

E. Sub Course description:
Modelling: 1st order differential equation

F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of differential equation	Listening	LCD White board Computer
2	PRESENTATION	130	Problem exercise and solving, application	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

G. Method of assessment
Home Work

H. Text Book

1. Erwin Kreyzig, *Advanced Engineering Mathematics*, John Willey&Sons, New York, 1987
2. N Piskunov, *Deffrential and Calculus Vol II*, Mir Publisher, Moscow, 1980
3. Murray R Spiegel, *Advanced Mathematicsfor Engineers & Scientists*, Mc Graw Hill Book Co, New York, 1990

STANDARD COURSE OUTLINE

Subject : 1ST **ENGINEERING MATHEMATICS**
Subject Code : TKM 211
Subject Credit : 3
Class schedule : 2 x 75 minutes
Lecture : 2nd

A. Course Objective
1. General Objective : Student have the ability to solve differential equation which can be seen on mechanical engineering field, vibration technique, heat transfer, fluid mechanics, thermodynamics, heat exchanger, refrigeration, turbine, etc.
2. Specific Objective : student have the ability to understand, doing problem exercise and find the right answer

B. Desirable student competencies:
Systematical thinking in real life, and to choose the right decisions

C. Course Method:
Presentation, Question and answer, problem exercise.

D. Main course description:
1st order differential equation

E. Sub Course description:
Modelling: 1st order linear differential equation and Bernoulli differential equation

F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of differential equation	Listening	LCD White board Computer
2	PRESENTATION	130	Problem exercise and solving, application	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

G. Method of assessment
Home Work

H. Text Book

1. Erwin Kreyzig, *Advanced Engineering Mathematics*, John Willey&Sons, New York, 1987
2. N Piskunov, *Deffrential and Calculus Vol II*, Mir Publisher, Moscow, 1980
3. Murray R Spiegel, *Advanced Mathematicsfor Engineers & Scientists*, Mc Graw Hill Book Co, New York, 1990

STANDARD COURSE OUTLINE

Subject : 1ST **ENGINEERING MATHEMATICS**
Subject Code : TKM 211
Subject Credit : 3
Class schedule : 2 x 75 minutes
Lecture : 3rd

A. Course Objective
1. General Objective : Student have the ability to solve differential equation which can be seen on mechanical engineering field, vibration technique, heat transfer, fluid mechanics, thermodynamics, heat exchanger, refrigeration, turbine, etc.
2. Specific Objective : student have the ability to understand, doing problem exercise and find the right answer

B. Desirable student competencies:
Systematical thinking in real life, and to choose the right decisions

C. Course Method:
Presentation, Question and answer, problem exercise.

D. Main course description:
1st order differential equation

E. Sub Course description:
Modelling: exact differential equations and integral factor

F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of differential equation	Listening	LCD White board Computer
2	PRESENTATION	130	Problem exercise and solving, application	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

G. Method of assessment
Home Work

H. Text Book

1. Erwin Kreyzig, *Advanced Engineering Mathematics*, John Willey&Sons, New York, 1987
2. N Piskunov, *Deffrential and Calculus Vol II*, Mir Publisher, Moscow, 1980
3. Murray R Spiegel, *Advanced Mathematicsfor Engineers & Scientists*, Mc Graw Hill Book Co, New York, 1990

STANDARD COURSE OUTLINE

Subject : 1ST **ENGINEERING MATHEMATICS**
Subject Code : TKM 211
Subject Credit : 3
Class schedule : 2 x 75 minutes
Lecture : 4th

A. Course Objective
1. General Objective : Student have the ability to solve differential equation which can be seen on mechanical engineering field, vibration technique, heat transfer, fluid mechanics, thermodynamics, heat exchanger, refrigeration, turbine, etc.
2. Specific Objective : student have the ability to understand, doing problem exercise and find the right answer

B. Desirable student competencies:
Systematical thinking in real life, and to choose the right decisions

C. Course Method:
Presentation, Question and answer, problem exercise.

D. Main course description:
2nd order differential equation, homogeneous linear coefficient

E. Sub Course description:
Modelling: 2nd order differential equation, linear homogenenous coefficient with 3 alternative answer

F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of differential equation	Listening	LCD White board Computer
2	PRESENTATION	130	Problem exercise and solving, application	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

G. Method of assessment
Home Work

H. Text Book

1. Erwin Kreyzig, *Advanced Engineering Mathematics*, John Willey&Sons, New York, 1987
2. N Piskunov, *Deffrential and Calculus Vol II*, Mir Publisher, Moscow, 1980
3. Murray R Spiegel, *Advanced Mathematicsfor Engineers & Scientists*, Mc Graw Hill Book Co, New York, 1990

STANDARD COURSE OUTLINE

Subject : 1ST **ENGINEERING MATHEMATICS**
Subject Code : TKM 211
Subject Credit : 3
Class schedule : 2 x 75 minutes
Lecture : 6th

A. Course Objective
1. General Objective : Student have the ability to solve differential equation which can be seen on mechanical engineering field, vibration technique, heat transfer, fluid mechanics, thermodynamics, heat exchanger, refrigeration, turbine, etc.
2. Specific Objective : student have the ability to understand, doing problem exercise and find the right answer

B. Desirable student competencies:
Systematical thinking in real life, and to choose the right decisions

C. Course Method:
Presentation, Question and answer, problem exercise.

D. Main course description:
3rd order differential equation, non-homogeneous linear coefficient

E. Sub Course description:
Modelling: 3rd order differential equation, with linear 3rdorder complex roots

F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of differential equation	Listening	LCD White board Computer
2	PRESENTATION	130	Problem exercise and solving, application	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

G. Method of assessment
Home Work

H. Text Book

1. Erwin Kreyzig, *Advanced Engineering Mathematics*, John Willey&Sons, New York, 1987
2. N Piskunov, *Deffrential and Calculus Vol II*, Mir Publisher, Moscow, 1980
3. Murray R Spiegel, *Advanced Mathematicsfor Engineers & Scientists*, Mc Graw Hill Book Co, New York, 1990

STANDARD COURSE OUTLINE

Subject : 1ST **ENGINEERING MATHEMATICS**
Subject Code : TKM 211
Subject Credit : 3
Class schedule : 2 x 75 minutes
Lecture : 7th

A. Course Objective
1. General Objective : Student have the ability to solve differential equation which can be seen on mechanical engineering field, vibration technique, heat transfer, fluid mechanics, thermodynamics, heat exchanger, refrigeration, turbine, etc.
2. Specific Objective : student have the ability to understand, doing problem exercise and find the right answer

B. Desirable student competencies:
Systematical thinking in real life, and to choose the right decisions

C. Course Method:
Presentation, Question and answer, problem exercise.

D. Main course description:
4th order differential equation, non-homogeneous linear coefficient

E. Sub Course description:
Modelling: 4th order differential equation, with linear 4th order complex roots

F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of differential equation	Listening	LCD White board Computer
2	PRESENTATION	130	Problem exercise and solving, application	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

G. Method of assessment
Home Work

H. Text Book

1. Erwin Kreyzig, *Advanced Engineering Mathematics*, John Willey&Sons, New York, 1987
2. N Piskunov, *Deffrential and Calculus Vol II*, Mir Publisher, Moscow, 1980
3. Murray R Spiegel, *Advanced Mathematicsfor Engineers & Scientists*, Mc Graw Hill Book Co, New York, 1990

STANDARD COURSE OUTLINE

Subject : 1ST **ENGINEERING MATHEMATICS**
Subject Code : TKM 211
Subject Credit : 3
Class schedule : 2 x 75 minutes
Lecture : 8th

A. Course Objective
1. General Objective : Student have the ability to solve differential equation which can be seen on mechanical engineering field, vibration technique, heat transfer, fluid mechanics, thermodynamics, heat exchanger, refrigeration, turbine, etc.
2. Specific Objective : student have the ability to understand, doing problem exercise and find the right answer

B. Desirable student competencies:
Systematical thinking in real life, and to choose the right decisions

C. Course Method:
Presentation, Question and answer, problem exercise.

D. Main course description:
Higher order diferential equation with complex roots

E. Sub Course description:
Cases of complex roots

F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of differential equation	Listening	LCD White board Computer
2	PRESENTATION	130	Problem exercise and solving, application	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

G. Method of assessment
Home Work

H. Text Book

1. Erwin Kreyzig, *Advanced Engineering Mathematics*, John Willey&Sons, New York, 1987
2. N Piskunov, *Deffrential and Calculus Vol II*, Mir Publisher, Moscow, 1980
3. Murray R Spiegel, *Advanced Mathematicsfor Engineers & Scientists*, Mc Graw Hill Book Co, New York, 1990

STANDARD COURSE OUTLINE

Subject : 1ST **ENGINEERING MATHEMATICS**
Subject Code : TKM 211
Subject Credit : 3
Class schedule : 2 x 75 minutes
Lecture : 9th

A. Course Objective
1. General Objective : Student have the ability to solve differential equation which can be seen on mechanical engineering field, vibration technique, heat transfer, fluid mechanics, thermodynamics, heat exchanger, refrigeration, turbine, etc.
2. Specific Objective : student have the ability to understand, doing problem exercise and find the right answer

B. Desirable student competencies:
Systematical thinking in real life, and to choose the right decisions

C. Course Method:
Presentation, Question and answer, problem exercise.

D. Main course description:
Simultaneous 1st order differential equation

E. Sub Course description:
Cases of 1st order differential equation

F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of differential equation	Listening	LCD White board Computer
2	PRESENTATION	130	Problem exercise and solving, application	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

G. Method of assessment
Home Work

H. Text Book

1. Erwin Kreyzig, *Advanced Engineering Mathematics*, John Willey&Sons, New York, 1987
2. N Piskunov, *Deffrential and Calculus Vol II*, Mir Publisher, Moscow, 1980
3. Murray R Spiegel, *Advanced Mathematicsfor Engineers & Scientists*, Mc Graw Hill Book Co, New York, 1990

STANDARD COURSE OUTLINE

Subject : 1ST **ENGINEERING MATHEMATICS**
Subject Code : TKM 211
Subject Credit : 3
Class schedule : 2 x 75 minutes
Lecture : 10th

A. Course Objective
1. General Objective : Student have the ability to solve differential equation which can be seen on mechanical engineering field, vibration technique, heat transfer, fluid mechanics, thermodynamics, heat exchanger, refrigeration, turbine, etc.
2. Specific Objective : student have the ability to understand, doing problem exercise and find the right answer

B. Desirable student competencies:
Systematical thinking in real life, and to choose the right decisions

C. Course Method:
Presentation, Question and answer, problem exercise.

D. Main course description:
Simultaneous 2nd order differential equation

E. Sub Course description:
Cases of 2nd order differential equation

F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of differential equation	Listening	LCD White board Computer
2	PRESENTATION	130	Problem exercise and solving, application	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

G. Method of assessment
Home Work

H. Text Book

1. Erwin Kreyzig, *Advanced Engineering Mathematics*, John Willey&Sons, New York, 1987
2. N Piskunov, *Deffrential and Calculus Vol II*, Mir Publisher, Moscow, 1980
3. Murray R Spiegel, *Advanced Mathematicsfor Engineers & Scientists*, Mc Graw Hill Book Co, New York, 1990

STANDARD COURSE OUTLINE

Subject : 1ST **ENGINEERING MATHEMATICS**
Subject Code : TKM 211
Subject Credit : 3
Class schedule : 2 x 75 minutes
Lecture : 11th

A. Course Objective
1. General Objective : Student have the ability to solve differential equation which can be seen on mechanical engineering field, vibration technique, heat transfer, fluid mechanics, thermodynamics, heat exchanger, refrigeration, turbine, etc.
2. Specific Objective : student have the ability to understand, doing problem exercise and find the right answer

B. Desirable student competencies:
Systematical thinking in real life, and to choose the right decisions

C. Course Method:
Presentation, Question and answer, problem exercise.

D. Main course description:
Simultaneous higher order differential equation

E. Sub Course description:
Cases of higher order differential equation

F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of differential equation	Listening	LCD White board Computer
2	PRESENTATION	130	Problem exercise and solving, application	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

G. Method of assessment
Home Work

H. Text Book

1. Erwin Kreyzig, *Advanced Engineering Mathematics*, John Willey&Sons, New York, 1987
2. N Piskunov, *Deffrential and Calculus Vol II*, Mir Publisher, Moscow, 1980
3. Murray R Spiegel, *Advanced Mathematicsfor Engineers & Scientists*, Mc Graw Hill Book Co, New York, 1990

STANDARD COURSE OUTLINE

Subject : 1ST **ENGINEERING MATHEMATICS**
Subject Code : TKM 211
Subject Credit : 3
Class schedule : 2 x 75 minutes
Lecture : 12th

A. Course Objective
1. General Objective : Student have the ability to solve differential equation which can be seen on mechanical engineering field, vibration technique, heat transfer, fluid mechanics, thermodynamics, heat exchanger, refrigeration, turbine, etc.
2. Specific Objective : student have the ability to understand, doing problem exercise and find the right answer

B. Desirable student competencies:
Systematical thinking in real life, and to choose the right decisions

C. Course Method:
Presentation, Question and answer, problem exercise.

D. Main course description:
Simultaneous higher order differential equation

E. Sub Course description:
Cases of higher order differential equation with complex roots

F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of differential equation	Listening	LCD White board Computer
2	PRESENTATION	130	Problem exercise and solving, application	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

G. Method of assessment
Home Work

H. Text Book

1. Erwin Kreyzig, *Advanced Engineering Mathematics*, John Willey&Sons, New York, 1987
2. N Piskunov, *Deffrential and Calculus Vol II*, Mir Publisher, Moscow, 1980
3. Murray R Spiegel, *Advanced Mathematicsfor Engineers & Scientists*, Mc Graw Hill Book Co, New York, 1990

STANDARD COURSE OUTLINE

Subject : 1ST **ENGINEERING MATHEMATICS**
Subject Code : TKM 211
Subject Credit : 3
Class schedule : 2 x 75 minutes
Lecture : 13th

A. Course Objective
1. General Objective : Student have the ability to solve differential equation which can be seen on mechanical engineering field, vibration technique, heat transfer, fluid mechanics, thermodynamics, heat exchanger, refrigeration, turbine, etc.
2. Specific Objective : student have the ability to understand, doing problem exercise and find the right answer

B. Desirable student competencies:
Systematical thinking in real life, and to choose the right decisions

C. Course Method:
Presentation, Question and answer, problem exercise.

D. Main course description:
Gamma function

E. Sub Course description:
Modelling: Gamma function

F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of differential equation	Listening	LCD White board Computer
2	PRESENTATION	130	Problem exercise and solving, application	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

G. Method of assessment
Home Work

H. Text Book

1. Erwin Kreyzig, *Advanced Engineering Mathematics*, John Willey&Sons, New York, 1987
2. N Piskunov, *Deffrential and Calculus Vol II*, Mir Publisher, Moscow, 1980
3. Murray R Spiegel, *Advanced Mathematicsfor Engineers & Scientists*, Mc Graw Hill Book Co, New York, 1990

STANDARD COURSE OUTLINE

Subject : 1ST **ENGINEERING MATHEMATICS**
Subject Code : TKM 211
Subject Credit : 3
Class schedule : 2 x 75 minutes
Lecture : 14th

A. Course Objective
1. General Objective : Student have the ability to solve differential equation which can be seen on mechanical engineering field, vibration technique, heat transfer, fluid mechanics, thermodynamics, heat exchanger, refrigeration, turbine, etc.
2. Specific Objective : student have the ability to understand, doing problem exercise and find the right answer

B. Desirable student competencies:
Systematical thinking in real life, and to choose the right decisions

C. Course Method:
Presentation, Question and answer, problem exercise.

D. Main course description:
Beta function

E. Sub Course description:
Modelling: Beta function

F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of differential equation	Listening	LCD White board Computer
2	PRESENTATION	130	Problem exercise and solving, application	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

G. Method of assessment
Home Work

H. Text Book

1. Erwin Kreyzig, *Advanced Engineering Mathematics*, John Willey&Sons, New York, 1987
2. N Piskunov, *Deffrential and Calculus Vol II*, Mir Publisher, Moscow, 1980
3. Murray R Spiegel, *Advanced Mathematicsfor Engineers & Scientists*, Mc Graw Hill Book Co, New York, 1990

Syllabus

Major subject : KINEMATIC AND DYNAMIC

CODE NUMBER/CREDIT: TKM 212/4 SKS

DESCRIPTION: students understand about movement principle and law Newton II for particle, particle system, and rigid body.

GENERAL INSTRUCTIONAL PURPOSE: this course introduces analytical thinking process and builds ability to predict force in creative design process

No	SPECIFIC INSTRUCTIONAL PURPOSE	MAJOR SUBJECT	SUB MAJOR SUBJECT	TE (50 MINUT)	TEACHING METOD	SOFT SKILL ABILITY	SP
1	Skillful to analyze rectilinear motion, tortuous motion with coordinate Cartesian system	KINEMATIC PARTICLE 1	Position, speed, acceleration, rectilinear motion, curve motion at field	2	presentation, discusion and practice	Be able to calculate position, speed with integration process	1
2	Skillful to analyze tortuous motion with coordinate systems normal-tangential & polar, motion of space with cylinder coordinate systems, and ball coordinate systems	KINEMATIC PARTICLE 2	Position, speed, acceleration, motion of curve: normal coordinate tangential, polar coordinates. Motion of Space: cylindrical coordinate, spherical coordinates	6	presentation, discusion and practice	Be able to choose coordinate systems matching with problem faced	1
3	Skillful to analyze relative motion and the relation of kinematic at control movement and movement of particle system	KINEMATIC PARTICLE 3	Degree of freedom, constrained motion	2	presentation, discusion and practice	Be able to build equation of constrained freedom 1degree system	1
4	Skillful to analyze the motion and cause by using style method	KINETIC PARTICLE 1	Law Newton II, rectilinear motion, curve motion: Cartesians, k.normal& tangential, k. polar	4	presentation, discusion and practice	Be able to build motion equation based on free body diagram	1
5	Using energy method and impulse-momentum method, skillful to analyze motion and cause by it self.	KINETIC PARTICLE 2	Work, gravitation potential energy, elastic potential energy, kinetic energy, impulse, linear momentum, moment, angular momentum	4	presentation, discusion and practice	Be able to choose correct method for finalize motion problem	1

6	Skillful applies energy method, conservation of momentum in solving impact case	**KINETIC PARTICLE 3**	Impact direct, oblique impact	2	presentation, discusion and practice	Be able to merge energy equation, momentum conservation	1
7	Skillful analyze the movement and cause, for various particle systems. Method which must be mastered is equation of motion method, energy, and impulse-momentum	**KINETIC PARTICLE SYSTEM**	Work, energy, impulse, moment, linear momentum, angular momentum	4	presentation, discusion and practice	Be able to merge energy equation, momentum conservation	1
8	Skillful analyze movement 2 dimension of rigid body. Matter covers usage of coordinate systems Cartesian, normal-tangential, and polar. Matter also covers relative motion and motion of constraint	**KINEMATIC RIGID BODY-FIELD MOVEMENT**	Absolute coordinate systems; coordinate relative systems; speed analysis, acceleration analysis, Carioles acceleration	6	presentation, discusion and practice	Be able to analyze velocity and acceleration	1
9	Skillful analyze movement 3 dimension of the rigid body and cause Matter covers usage of equation of motion method, energy, and impulse-momentum.	**KINETIC RIGID BODY-FIELD MOVEMENT**	Force method, energy method, impulse & momentum	6	presentation, discusion and practice	Be able to choose correct method to solve motion problem	1
10	Skillful analyze 3 dimension movements of peripatetic rigid body. Matter covers usage of coordinate systems Cartesian, cylinder, and ball. Matter also covers relative motion and motion of constraint	**KINEMATIC RIGID BODY-SPACE MOVEMENT**	Coordinate Cartesian, ball cylinder	2	presentation, discusion and practice	Be able to of analyze velocity and acceleration	1
11	Skillful analyze 3 dimension movements of the rigid body and cause. Matter covers usage of coordinate systems Cartesian, cylinder, and ball. Matter also covers relative motion and motion of constraint	**KINETIC RIGID BODY-SPACE MOVEMENT**	Force method, energy method, impulse & momentum	2	presentation, discusion and practice	Be able to merge energy equation, momentum conservation	1
12	Understanding and can analyze harmonious motion and movement cause.	**HARMONIOUS MOTION**	Equation of motion, free vibration, forced vibration	4	presentation, discusion and practice	Recognizes base vibration phenomenon of 1 degree freedom system	1

13	Skillful analyze kinetics mechanisms for various used, for example: cam, gear, etc.	**MECHANISM 1**	Velocity analysis, acceleration analysis	6	presentation, discusion and practice	Be able to analyze velocity, and acceleration at 4 bar mechanism, glider mechanism and composite.	2
14	Skillful analyze kinetics mechanisms for various used, for example: cam, gear, etc.	**MECHANISM 2**	Force analysis, energy method	6	presentation, discusion and practice	Be able to calculate dynamic load at mechanism	2
15	Understanding the problem synthesis method, those are graphical method and linear analytical method	**PENGANTAR SINTESA**	Graphical method, numeric method	4	presentation, discusion and practice	Be able to design simple	2
				60			

Book of Reference:

1. *Engineering Mechanics Vol. 2 Dynamics*, 3rd ed. J.I. Meriam, L.G. Kraige, Jhon Wiley & Sons. Inc., 1993
2. *Mechanism Design: Analysis and Synthesis Vol. 1*, Arthur G. Erdman, George N. Sandor, Prfentice Hall, 1984.

SET EVENT OF STUDY (SAP)

MAJOR SUBJECT TITLE: KINEMATIC AND DYNAMIC
SUBJECT TITLE CODE : TKM 212
SKS: 4
MEETING TIME : 2 X 50 MINUT
MEETING TO : 1

A. INSTRUKSIONAL PURPOSE
1. GENERAL
Understand Position concept, speed, acceleration, rectilinear motion, and curve motion at field

2. SPECIAL
Skillful to analyze rectilinear motion, tortuous motion with coordinate Cartesian system

B. KEMAMPUAN SOFT SKILL
Be able to calculate position, speed with integration process.

C. STUDY METHOD
Presentation, discussion and practice

D. DISCUSSION FUNDAMENTAL
KINEMATIC PARTICLE 1

E. SUB DISCUSSION FUNDAMENTAL
Position, speed, acceleration, rectilinear motion, curve motion at field.

F. COURSE ACTIVITY

STEPS	TIME (MINUT)	TENTOR ACTIVITY	STUDENT ACTIVITY	MEDIA AND STUDY EQUIPMENT
INTRODUCTION	5	prolog	Introducing test	Lcd, computer, white board
PRESENTATION	90	Presentation, discussion, and examination	Asking question and propose the idea	Lcd, computer, white board
CONCLUSION	5	conclusion	Asking question and propose the idea	Lcd, computer, white board

G. EVALUATION
Homework and small examination.
H. BILBILIOGRAPHY
1. *Engineering Mechanics Vol. 2 Dynamics*, 3rd ed. J.I. Meriam, L.G. Kraige, Jhon Wiley & Sons. Inc., 1993

MAJOR SUBJECT TITLE: KINEMATIC AND DYNAMIC
SUBJECT TITLE CODE : TKM 212
SKS: 4
MEETING TIME : 6 X 50 MINUT
MEETING TO : 2,3,4

A. INSTRUKSIONAL PURPOSE
1. GENERAL
Be able to describing particle motion at field.

2. SPECIAL
Skillful to analyze tortuous motion with coordinate systems normal-tangential & polar, motion of space with cylinder coordinate systems, and ball coordinate systems.

B. KEMAMPUAN SOFT SKILL
Be able to choose coordinate systems matching with problem faced

C. STUDY METHOD
Presentation, discussion and practice

D. DISCUSSION FUNDAMENTAL
KINEMATIC PARTICLE 2

E. SUB DISCUSSION FUNDAMENTAL
Position, speed, acceleration, motion of curve: normal coordinate tangential, polar coordinates. Motion of Space: cylindrical coordinate, spherical coordinates.

F. COURSE ACTIVITY

STEPS	TIME (MINUT)	TENTOR ACTIVITY	STUDENT ACTIVITY	MEDIA AND STUDY EQUIPMENT
INTRODUCTION	15	prolog	Introducing test	Lcd, computer, white board
PRESENTATION	270	Presentation, discussion, and examination	Asking question and propose the idea	Lcd, computer, white board
CONCLUSION	15	conclusion	Asking question and propose the idea	Lcd, computer, white board

G. EVALUATION
Homework and small examination.

H. BILBILIOGRAPHY
1. *Engineering Mechanics Vol. 2 Dynamics*, 3rd ed. J.I. Meriam, L.G. Kraige, Jhon Wiley & Sons. Inc., 1993

MAJOR SUBJECT TITLE: KINEMATIC AND DYNAMIC
SUBJECT TITLE CODE : TKM 212
SKS: 4
MEETING TIME : 2 X 50 MINUT
MEETING TO : 5

A. INSTRUKSIONAL PURPOSE
1. GENERAL
Understand relative motion and control movement and movement of particle system
2. SPECIAL
Skillful to analyze relative motion and the relation of kinematic at control movement and movement of particle system

B. KEMAMPUAN SOFT SKILL
Be able to build equation of constrained freedom 1 degree of system

C. STUDY METHOD
Presentation, discussion and practice

D. DISCUSSION FUNDAMENTAL
KINETIC PARTICLE SYSTEM

E. SUB DISCUSSION FUNDAMENTAL
Degree of freedom, constrained motion

F. COURSE ACTIVITY

STEPS	TIME (MINUT)	TENTOR ACTIVITY	STUDENT ACTIVITY	MEDIA AND STUDY EQUIPMENT
INTRODUCTION	5	prolog	Introducing test	Lcd, computer, white board
PRESENTATION	90	Presentation, discussion, and examination	Asking question and propose the idea	Lcd, computer, white board
CONCLUSION	5	conclusion	Asking question and propose the idea	Lcd, computer, white board

G. EVALUATION
Homework and small examination.
H. BILBILIOGRAPHY
1. *Engineering Mechanics Vol. 2 Dynamics*, 3rd ed. J.I. Meriam, L.G. Kraige, Jhon Wiley & Sons. Inc., 1993

MAJOR SUBJECT TITLE: KINEMATIC AND DYNAMIC
SUBJECT TITLE CODE : TKM 212
SKS: 4
MEETING TIME : 4 x 50 MINUT
MEETING TO : 6, 7

A. INSTRUKSIONAL PURPOSE
1. GENERAL
Understand application of Newton Law motion II in curve motion at field

2. SPECIAL
Skillful to analyze the motion and cause by using force method

B. KEMAMPUAN SOFT SKILL
Be able to build motion equation based on free body diagram.

C. STUDY METHOD
Presentation, discussion and practice

D. DISCUSSION FUNDAMENTAL
KINETIC PARTICLE 1

E. SUB DISCUSSION FUNDAMENTAL
Law Newton II, rectilinear motion, curve motion: Cartesians, k.normal& tangential, k. polar

F. COURSE ACTIVITY

STEPS	TIME (MINUT)	TENTOR ACTIVITY	STUDENT ACTIVITY	MEDIA AND STUDY EQUIPMENT
INTRODUCTION	5	prolog	Introducing test	Lcd, computer, white board
PRESENTATION	90	Presentation, discussion, and examination	Asking question and propose the idea	Lcd, computer, white board
CONCLUSION	5	conclusion	Asking question and propose the idea	Lcd, computer, white board

G. EVALUATION
Homework and small examination.
H. BILBILIOGRAPHY
1. *Engineering Mechanics Vol. 2 Dynamics*, 3rd ed. J.I. Meriam, L.G. Kraige, Jhon Wiley & Sons. Inc., 1993

MAJOR SUBJECT TITLE: KINEMATIC AND DYNAMIC
SUBJECT TITLE CODE : TKM 212
SKS: 4
MEETING TIME :4 X 50 MINUT
MEETING TO : 8,9

A. INSTRUKSIONAL PURPOSE
1. GENERAL
Understand energy method and impulse-momentum method, skillful to analyze motion and cause by it self
2. SPECIAL
Using energy method and impulse-momentum method, skillful to analyze motion and cause by it self.

B. KEMAMPUAN SOFT SKILL
Be able to choose correct method for finalize motion problem.

C. STUDY METHOD
Presentation, discussion and practice

D. DISCUSSION FUNDAMENTAL
KINETIC PARTICLE 2

E. SUB DISCUSSION FUNDAMENTAL
Work, gravitation potential energy, elastic potential energy, kinetic energy, impulse, linear momentum, moment, angular momentum

F. COURSE ACTIVITY

STEPS	TIME (MINUT)	TENTOR ACTIVITY	STUDENT ACTIVITY	MEDIA AND STUDY EQUIPMENT
INTRODUCTION	10	prolog	Introducing test	Lcd, computer, white board
PRESENTATION	180	Presentation, discussion, and examination	Asking question and propose the idea	Lcd, computer, white board
CONCLUSION	10	conclusion	Asking question and propose the idea	Lcd, computer, white board

G. EVALUATION
Homework and small examination.
H. BILBILIOGRAPHY
1. *Engineering Mechanics Vol. 2 Dynamics*, 3rd ed. J.I. Meriam, L.G. Kraige, Jhon Wiley & Sons. Inc., 1993

MAJOR SUBJECT TITLE: KINEMATIC AND DYNAMIC
SUBJECT TITLE CODE : TKM 212
SKS: 4
MEETING TIME : 2 X 50 MINUT
MEETING TO : 10

A. INSTRUKSIONAL PURPOSE
1. GENERAL
Understand Position concept, speed, acceleration, rectilinear motion, and curve motion at field

2. SPECIAL
Skillful applies energy method, conservation of momentum in solving impact case.

B. KEMAMPUAN SOFT SKILL
Be able to merge energy equation, momentum conservation.

C. STUDY METHOD
Presentation, discussion and practice

D. DISCUSSION FUNDAMENTAL
KINETIC PARTICLE 2

E. SUB DISCUSSION FUNDAMENTAL
Impact direct, oblique impact

F. COURSE ACTIVITY

STEPS	TIME (MINUT)	TENTOR ACTIVITY	STUDENT ACTIVITY	MEDIA AND STUDY EQUIPMENT
INTRODUCTION	5	prolog	Introducing test	Lcd, computer, white board
PRESENTATION	90	Presentation, discussion, and examination	Asking question and propose the idea	Lcd, computer, white board
CONCLUSION	5	conclusion	Asking question and propose the idea	Lcd, computer, white board

G. EVALUATION
Homework and small examination.
H. BILBILIOGRAPHY
1. *Engineering Mechanics Vol. 2 Dynamics*, 3rd ed. J.I. Meriam, L.G. Kraige, Jhon Wiley & Sons. Inc., 1993

MAJOR SUBJECT TITLE: KINEMATIC AND DYNAMIC
SUBJECT TITLE CODE : TKM 212
SKS: 4
MEETING TIME : 2 X 50 MINUT
MEETING TO : 11, 12

A. INSTRUKSIONAL PURPOSE
1. GENERAL
Understand particle system to the rigid body.
2. SPECIAL
Skillful analyze the movement and cause, for various particle systems. Method which must be mastered is equation of motion method, energy, and impulse-momentum

B. KEMAMPUAN SOFT SKILL

Be able to use Newton II law, merge energy equation, momentum conservation for particle system.

C. STUDY METHOD
Presentation, discussion and practice

D. DISCUSSION FUNDAMENTAL
KINETIC PARTICLE SYSTEM

E. SUB DISCUSSION FUNDAMENTAL
Work, energy, impulse, moment, linear momentum, angular momentum

F. COURSE ACTIVITY

STEPS	TIME (MINUT)	TENTOR ACTIVITY	STUDENT ACTIVITY	MEDIA AND STUDY EQUIPMENT
INTRODUCTION	10	prolog	Introducing test	Lcd, computer, white board
PRESENTATION	180	Presentation, discussion, and examination	Asking question and propose the idea	Lcd, computer, white board
CONCLUSION	10	conclusion	Asking question and propose the idea	Lcd, computer, white board

G. EVALUATION
Homework and small examination.
H. BILBILIOGRAPHY
1. *Engineering Mechanics Vol. 2 Dynamics*, 3rd ed. J.I. Meriam, L.G. Kraige, Jhon Wiley & Sons. Inc., 1993

MAJOR SUBJECT TITLE: KINEMATIC AND DYNAMIC
SUBJECT TITLE CODE : TKM 212
SKS: 4
MEETING TIME : 2 X 50 MINUT
MEETING TO : 13, 14, 15

A. INSTRUKSIONAL PURPOSE
1. GENERAL
Understand movement of rigid body type at field.

2. SPECIAL
Skillful analyze movement 2 dimension of rigid body. Matter covers usage of coordinate systems Cartesian, normal-tangential, and polar. Major subject also covers relative motion and motion of constraint.

B. KEMAMPUAN SOFT SKILL
Be able to analyze velocity and acceleration

C. STUDY METHOD
Presentation, discussion and practice

D. DISCUSSION FUNDAMENTAL
KINEMATIC RIGID BODY-FIELD MOVEMENT

E. SUB DISCUSSION FUNDAMENTAL
Absolute coordinate systems; coordinate relative systems; speed analysis, acceleration analysis, Carioles acceleration

F. COURSE ACTIVITY

STEPS	TIME (MINUT)	TENTOR ACTIVITY	STUDENT ACTIVITY	MEDIA AND STUDY EQUIPMENT
INTRODUCTION	15	prolog	Introducing test	Lcd, computer, white board
PRESENTATION	270	Presentation, discussion, and examination	Asking question and propose the idea	Lcd, computer, white board
CONCLUSION	15	conclusion	Asking question and propose the idea	Lcd, computer, white board

G. EVALUATION
Homework and small examination.
H. BILBILIOGRAPHY
1. *Engineering Mechanics Vol. 2 Dynamics*, 3rd ed. J.I. Meriam, L.G. Kraige, Jhon Wiley & Sons. Inc., 1993

MAJOR SUBJECT TITLE: KINEMATIC AND DYNAMIC
SUBJECT TITLE CODE : TKM 212
SKS: 4
MEETING TIME : 6 X 50 MINUT
MEETING TO : 16, 17, 18

A. INSTRUKSIONAL PURPOSE
1. GENERAL
Understand Position concept, speed, acceleration, rectilinear motion, and curve motion at field

2. SPECIAL
Skillful analyze movement 3 dimension of the rigid body and cause Matter covers usage of equation of motion method, energy, and impulse-momentum

B. KEMAMPUAN SOFT SKILL
Be able to choose correct method to solve motion problem

C. STUDY METHOD
Presentation, discussion and practice

D. DISCUSSION FUNDAMENTAL
KINETIC RIGID BODY-FIELD MOVEMENT

E. SUB DISCUSSION FUNDAMENTAL
Force method, energy method, impulse & momentum

F. COURSE ACTIVITY

STEPS	TIME (MINUT)	TENTOR ACTIVITY	STUDENT ACTIVITY	MEDIA AND STUDY EQUIPMENT
INTRODUCTION	15	prolog	Introducing test	Lcd, computer, white board
PRESENTATION	270	Presentation, discussion, and examination	Asking question and propose the idea	Lcd, computer, white board
CONCLUSION	15	conclusion	Asking question and propose the idea	Lcd, computer, white board

G. EVALUATION
Homework and small examination.
H. BILBILIOGRAPHY
1. *Engineering Mechanics Vol. 2 Dynamics*, 3rd ed. J.I. Meriam, L.G. Kraige, Jhon Wiley & Sons. Inc., 1993

MAJOR SUBJECT TITLE: KINEMATIC AND DYNAMIC
SUBJECT TITLE CODE : TKM 212
SKS: 4
MEETING TIME : 2 X 50 MINUT
MEETING TO : 19

A. INSTRUKSIONAL PURPOSE
1. GENERAL
Understand coordinate system to solve kinematic rigid body analysis in space movement.

2. SPECIAL
Skillful analyze 3 dimension movements of peripatetic rigid body. Matter covers usage of coordinate systems Cartesian, cylinder, and ball. Matter also covers relative motion and motion of constraint.

B. KEMAMPUAN SOFT SKILL
Be able to of analyze velocity and acceleration

C. STUDY METHOD
Presentation, discussion and practice

D. DISCUSSION FUNDAMENTAL
KINEMATIC RIGID BODY-SPACE MOVEMENT

E. SUB DISCUSSION FUNDAMENTAL
Coordinate Cartesian, ball cylinder

F. COURSE ACTIVITY

STEPS	TIME (MINUT)	TENTOR ACTIVITY	STUDENT ACTIVITY	MEDIA AND STUDY EQUIPMENT
INTRODUCTION	15	prolog	Introducing test	Lcd, computer, white board
PRESENTATION	270	Presentation, discussion, and examination	Asking question and propose the idea	Lcd, computer, white board
CONCLUSION	15	conclusion	Asking question and propose the idea	Lcd, computer, white board

G. EVALUATION
Homework and small examination.
H. BILBILIOGRAPHY
1. *Engineering Mechanics Vol. 2 Dynamics*, 3rd ed. J.I. Meriam, L.G. Kraige, Jhon Wiley & Sons. Inc., 1993

MAJOR SUBJECT TITLE: KINEMATIC AND DYNAMIC
SUBJECT TITLE CODE : TKM 212
SKS: 4
MEETING TIME : 2 X 50 MINUT
MEETING TO : 20

A. INSTRUKSIONAL PURPOSE
1. GENERAL
Understand dynamical analysis to rigid body in space.

2. SPECIAL
Skillful analyze 3 dimension movements of the rigid body and cause. Matter covers usage of coordinate systems Cartesian, cylinder, and ball. Matter also covers relative motion and motion of constraint.

B. KEMAMPUAN SOFT SKILL
Be able to merge energy equation, momentum conservation

C. STUDY METHOD
Presentation, discussion and practice

D. DISCUSSION FUNDAMENTAL
KINETIC RIGID BODY-SPACE MOVEMENT

E. SUB DISCUSSION FUNDAMENTAL
Force method, energy method, impulse & momentum.

F. COURSE ACTIVITY

STEPS	TIME (MINUT)	TENTOR ACTIVITY	STUDENT ACTIVITY	MEDIA AND STUDY EQUIPMENT
INTRODUCTION	5	prolog	Introducing test	Lcd, computer, white board
PRESENTATION	90	Presentation, discussion, and examination	Asking question and propose the idea	Lcd, computer, white board
CONCLUSION	5	conclusion	Asking question and propose the idea	Lcd, computer, white board

G. EVALUATION
Homework and small examination.
H. BILBILIOGRAPHY
1. *Engineering Mechanics Vol. 2 Dynamics*, 3rd ed. J.I. Meriam, L.G. Kraige, Jhon Wiley & Sons. Inc., 1993

MAJOR SUBJECT TITLE: KINEMATIC AND DYNAMIC
SUBJECT TITLE CODE : TKM 212
SKS: 4
MEETING TIME : 4 X 50 MINUT
MEETING TO : 21,22

A. INSTRUKSIONAL PURPOSE
1. GENERAL
Understand movement equation to get harmonious function.

2. SPECIAL
Understanding and can analyze harmonious motion and movement cause.

B. KEMAMPUAN SOFT SKILL
Recognizes base vibration phenomenon of 1 degree freedom system

C. STUDY METHOD
Presentation, discussion and practice

D. DISCUSSION FUNDAMENTAL
HARMONIOUS MOVEMENT

E. SUB DISCUSSION FUNDAMENTAL
Equation of motion, free vibration, forced vibration

F. COURSE ACTIVITY

STEPS	TIME (MINUT)	TENTOR ACTIVITY	STUDENT ACTIVITY	MEDIA AND STUDY EQUIPMENT
INTRODUCTION	10	prolog	Introducing test	Lcd, computer, white board
PRESENTATION	180	Presentation, discussion, and examination	Asking question and propose the idea	Lcd, computer, white board
CONCLUSION	10	conclusion	Asking question and propose the idea	Lcd, computer, white board

G. EVALUATION
Homework and small examination.
H. BILBILIOGRAPHY
1. *Engineering Mechanics Vol. 2 Dynamics*, 3rd ed. J.I. Meriam, L.G. Kraige, Jhon Wiley & Sons. Inc., 1993

MAJOR SUBJECT TITLE: KINEMATIC AND DYNAMIC
SUBJECT TITLE CODE : TKM 212
SKS: 4
MEETING TIME : 6 X 50 MINUT
MEETING TO : 22, 23, 24

A. INSTRUKSIONAL PURPOSE
1. GENERAL
Understand and be able to simple kinematic mechanism implementation.

2. SPECIAL
Skillful analyze kinetics mechanisms for various used, for example: cam, gear, etc.

B. KEMAMPUAN SOFT SKILL
Be able to analyze velocity, and acceleration at 4 bar mechanism, glider mechanism and composite..

C. STUDY METHOD
Presentation, discussion and practice

D. DISCUSSION FUNDAMENTAL
MECHANISM 1

E. SUB DISCUSSION FUNDAMENTAL
Velocity analysis, acceleration analysis

F. COURSE ACTIVITY

STEPS	TIME (MINUT)	TENTOR ACTIVITY	STUDENT ACTIVITY	MEDIA AND STUDY EQUIPMENT
INTRODUCTION	15	prolog	Introducing test	Lcd, computer, white board
PRESENTATION	270	Presentation, discussion, and examination	Asking question and propose the idea	Lcd, computer, white board
CONCLUSION	15	conclusion	Asking question and propose the idea	Lcd, computer, white board

G. EVALUATION
Homework and small examination.
H. BILBILIOGRAPHY
1. *Engineering Mechanics Vol. 2 Dynamics*, 3rd ed. J.I. Meriam, L.G. Kraige, Jhon Wiley & Sons. Inc., 1993

MAJOR SUBJECT TITLE: KINEMATIC AND DYNAMIC
SUBJECT TITLE CODE : TKM 212
SKS: 4
MEETING TIME : 2 X 50 MINUT
MEETING TO : 25, 26, 27

A. INSTRUKSIONAL PURPOSE
1. GENERAL
Understand and be able to analyze dynamic in simple dynamic.

2. SPECIAL
Skillful analyze kinetics mechanisms for various used, for example: cam, gear, etc.

B. KEMAMPUAN SOFT SKILL
Be able to calculate position, speed with integration process.

C. STUDY METHOD
Presentation, discussion and practice

D. DISCUSSION FUNDAMENTAL
KINEMATIC PARTICLE 1

E. SUB DISCUSSION FUNDAMENTAL
Position, speed, acceleration, rectilinear motion, curve motion at field.

F. COURSE ACTIVITY

STEPS	TIME (MINUT)	TENTOR ACTIVITY	STUDENT ACTIVITY	MEDIA AND STUDY EQUIPMENT
INTRODUCTION	15	prolog	Introducing test	Lcd, computer, white board
PRESENTATION	270	Presentation, discussion, and examination	Asking question and propose the idea	Lcd, computer, white board
CONCLUSION	15	conclusion	Asking question and propose the idea	Lcd, computer, white board

G. EVALUATION
Homework and small examination.
H. BILBILIOGRAPHY
1. *Engineering Mechanics Vol. 2 Dynamics*, 3rd ed. J.I. Meriam, L.G. Kraige, Jhon Wiley & Sons. Inc., 1993

MAJOR SUBJECT TITLE: KINEMATIC AND DYNAMIC
SUBJECT TITLE CODE : TKM 212
SKS: 4
MEETING TIME : 4 X 50 MINUT
MEETING TO : 28, 29

A. INSTRUKSIONAL PURPOSE
1. GENERAL
Understand design process for simple mechanism.

2. SPECIAL
Understanding the problem synthesis method, those are graphical method and linear analytical method

B. KEMAMPUAN SOFT SKILL
Be able to design simple mechanism.

C. STUDY METHOD
Presentation, discussion and practice

D. DISCUSSION FUNDAMENTAL
SYNTESIA INTRODUCTION

E. SUB DISCUSSION FUNDAMENTAL
Graphical method, numeric method

F. COURSE ACTIVITY

STEPS	TIME (MINUT)	TENTOR ACTIVITY	STUDENT ACTIVITY	MEDIA AND STUDY EQUIPMENT
INTRODUCTION	10	prolog	Introducing test	Lcd, computer, white board
PRESENTATION	180	Presentation, discussion, and examination	Asking question and propose the idea	Lcd, computer, white board
CONCLUSION	10	conclusion	Asking question and propose the idea	Lcd, computer, white board

G. EVALUATION
Homework and small examination.
H. BILBILIOGRAPHY
1. *Engineering Mechanics Vol. 2 Dynamics*, 3rd ed. J.I. Meriam, L.G. Kraige, Jhon Wiley & Sons. Inc., 1993

SYLLABUS

MAJOR SUBJECT : MATERIAL STRENGTH MECHANIC

CODE NUMBER/CREDIT: TKM 214/ 3 SKS

DESCRIPTION: This major subject develop performance analysis a problem that is logical and simple, and applicate basic principle that already exsist.

GENERAL INSTRUCTION PURPOSE: student understand about equivalent principle and hooke law for hukum Hooke for deflection and stress analysis.

No	SPECIFIC INSTRUCTIONAL PURPOSE	MAJOR SUBJECT	SUB MAJOR SUBJECT	TE (50 MINUT)	TEACHING METOD	SOFT SKILL ABILITY	SP
1	Understanding define of tension and of tensions types according to its load, be able to make normal force distribution and latitude, bending moment and torsion	FORCE FLOW AND TENSION CONCEPT	Introducing, force flow at material, forces review and internal moment, tension concept, tension types (normal, shift, pad tension)	3	tatap muka, diskusi, latihan	Be able to imagine force flow at simple structure, and effect of stream load to tension	1
2	Recognizes and be able to apply balance principle and Hooke law for encumbering case axial	AXIAL LOAD	Draws test & mechanical properties, Hooke law, normal stress, deflection, indefinite static, temperature influence	4	tatap muka, diskusi, latihan	Be able to estimate requirement of measure cube profile encumbered by axial load	1
3	Recognizes and be able to calculate shear stress and twist angle as result of rotation load at solid cylindrical	TORSION LOAD	Twist angle, shear stress	3	tatap muka, diskusi, latihan	Be able to estimate axis diameter, knows shear stress distribution at axis	1
4	Recognizes and be able to calculate normal stress as result of pure flexible load at bar solid cylindrical	ELASTIC LOAD	Degradation of elastic formulation, tension as result of elastic moment	3	tatap muka, diskusi, latihan	Knows distribution of normal stress at cube profile	1
5	Recognizes and be able to calculate normal stress as result of pure shear load at solid cylindrical	SHEAR LOAD	Shear stress as result of shear load, shear stress stream	3	tatap muka, diskusi, latihan	Knows distribution of shear stress at cube profile	1
6	Be able to elaborate tension in so many corner orientations	STRESS TRANSFORMATION	Tension transformation equation, Mohr's circle for plane stress	3	tatap muka, diskusi, latihan	Be able to apply Mohr's circle in main tensions calculation, and maximum shear stress	1
7	Be able to apply simple stress analysis as result of load compound using Mohr's circle	STRESS ANALYSIS	Load combination: axial load& elastic moment, elastic moment & torque	4	tatap muka, diskusi, latihan	Be able to calculate maximum active pressure at point in a profile	1
8	Be able to calculate active pressure at thin wall pressure vessel	THIN WALL PRESSURE VESSEL	Cylinder pressure vessel, ball pressure vessel	3	tatap muka, diskusi, latihan	Be able to estimate minimum wall thick	1

9	Be able to calculate deflection at cube for concentrated load case, distributed load, and compound load	DEFLECTION AT CUBE	Elastic curve equation, integration method, moment wide method, energy method	6	tatap muka, diskusi, latihan	Be able to solve reduction of buckling	1
10	Be able to calculate reaction forces at indefinite statist case	INDEFINITE STATIC AT CUBE	Superposition method, transfer method, and energy method	6	tatap muka, diskusi, latihan	Realizes firmer indefinite static compared certain static	1
11	Be able to estimate critical load at simple cube	BUCKLING AT SIMPLE CUBE	Buckling phenomenon, formulation of critical load for simple cube, comparison between failure buckling and failure yield	4	tatap muka, diskusi, latihan	Be able to anticipate buckling influence, and dominant variable at buckling failure phenomenon	1
				42			

keterangan:
EW : estimasi waktu
SP: sumber pustaka

Pustaka:
1. *Mechanics of Materilas*, SI Metric Edition, Ferdinant P. Beer, E. Russell Johnston, Jr., Mc Graw-Hill, 1987.

SET EVENT OF STUDY (SAP)

MAJOR SUBJECT TITLE: MECHANICAL OF MATERIAL STRENGTH
SUBJECT TITLE CODE : TKM 214
SKS: 3
MEETING TIME : 3 X 50 MINUT
MEETING TO : 1,2

A. INSTRUKSIONAL PURPOSE
1. GENERAL
Understand Position concept, speed, acceleration, rectilinear motion, and curve motion at field

2. SPECIAL
Understanding define of tension and of tensions types according to its load, be able to make normal force distribution and latitude, bending moment and torsion

B. KEMAMPUAN SOFT SKILL
Be able to imagine force flow at simple structure, and effect of stream load to tension
C. STUDY METHOD
Presentation, discussion and practice

D. DISCUSSION FUNDAMENTAL
FORCE FLOW AND TENSION CONCEPT

E. SUB DISCUSSION FUNDAMENTAL
Position, speed, acceleration, rectilinear motion, curve motion at field.

F. COURSE ACTIVITY

STEPS	TIME (MINUT)	TENTOR ACTIVITY	STUDENT ACTIVITY	MEDIA AND STUDY EQUIPMENT
INTRODUCTION	10	prolog	Introducing test	Lcd, computer, white board
PRESENTATION	130	Presentation, discussion, and examination	Asking question and propose the idea	Lcd, computer, white board
CONCLUSION	10	conclusion	Asking question and propose the idea	Lcd, computer, white board

G. EVALUATION
Homework and small examination.
H. BILBILIOGRAPHY
1. *Mechanics of Materials*, SI Metric Edition, Ferdinant P. Beer, E. Russell Johnston, Jr., Mc Graw-Hill, 1987.

SET EVENT OF STUDY (SAP)

MAJOR SUBJECT TITLE: MECHANICAL OF MATERIAL STRENGTH
SUBJECT TITLE CODE : TKM 214
SKS: 3
MEETING TIME : 4 X 50 MINUT
MEETING TO : 3, 4, 5

A. INSTRUKSIONAL PURPOSE
1. GENERAL
Understand Position concept, speed, acceleration, rectilinear motion, and curve motion at field

2. SPECIAL
Recognizes and be able to apply balance principle and Hooke law for encumbering case axial

B. KEMAMPUAN SOFT SKILL
Be able to estimate requirement of measure cube profile encumbered by axial load

C. STUDY METHOD
Presentation, discussion and practice

D. DISCUSSION FUNDAMENTAL
AXIAL LOAD

E. SUB DISCUSSION FUNDAMENTAL
Draws test & mechanical properties, Hooke law, normal stress, deflection, indefinite static, temperature influence

F. COURSE ACTIVITY

STEPS	TIME (MINUT)	TENTOR ACTIVITY	STUDENT ACTIVITY	MEDIA AND STUDY EQUIPMENT
INTRODUCTION	15	prolog	Introducing test	Lcd, computer, white board
PRESENTATION	170	Presentation, discussion, and examination	Asking question and propose the idea	Lcd, computer, white board
CONCLUSION	150	conclusion	Asking question and propose the idea	Lcd, computer, white board

G. EVALUATION
Homework and small examination.

H. BILBILIOGRAPHY
1. *Mechanics of Materials*, SI Metric Edition, Ferdinant P. Beer, E. Russell Johnston, Jr., Mc Graw-Hill, 1987.

SET EVENT OF STUDY (SAP)

MAJOR SUBJECT TITLE: MECHANICAL OF MATERIAL STRENGTH
SUBJECT TITLE CODE : TKM 214
SKS: 3
MEETING TIME : 3 X 50 MINUT
MEETING TO : 5, 6, 7

A. INSTRUKSIONAL PURPOSE
1. GENERAL
Understand Position concept, speed, acceleration, rectilinear motion, and curve motion at field

2. SPECIAL
Recognizes and be able to calculate shear stress and twist angle as result of rotation load at solid cylindrical

B. KEMAMPUAN SOFT SKILL
Be able to estimate axis diameter, knows shear stress distribution at axis

C. STUDY METHOD
Presentation, discussion and practice

D. DISCUSSION FUNDAMENTAL
TORSION LOAD

E. SUB DISCUSSION FUNDAMENTAL
Twist angle, shear stress

F. COURSE ACTIVITY

STEPS	TIME (MINUT)	TENTOR ACTIVITY	STUDENT ACTIVITY	MEDIA AND STUDY EQUIPMENT
INTRODUCTION	15	prolog	Introducing test	Lcd, computer, white board
PRESENTATION	170	Presentation, discussion, and examination	Asking question and propose the idea	Lcd, computer, white board
CONCLUSION	150	conclusion	Asking question and propose the idea	Lcd, computer, white board

G. EVALUATION
Homework and small examination.

H. BILBILIOGRAPHY
1. *Mechanics of Materials*, SI Metric Edition, Ferdinant P. Beer, E. Russell Johnston, Jr., Mc Graw-Hill, 1987.

SET EVENT OF STUDY (SAP)

MAJOR SUBJECT TITLE: MECHANICAL OF MATERIAL STRENGTH
SUBJECT TITLE CODE : TKM 214
SKS: 3
MEETING TIME : 3 X 50 MINUT
MEETING TO : 8, 9

A. INSTRUKSIONAL PURPOSE
1. GENERAL
Understand Position concept, speed, acceleration, rectilinear motion, and curve motion at field

2. SPECIAL
Recognizes and be able to calculate normal stress as result of pure flexible load at bar solid cylindrical

B. KEMAMPUAN SOFT SKILL
Knows distribution of normal stress at cube profile

C. STUDY METHOD
Presentation, discussion and practice

D. DISCUSSION FUNDAMENTAL
ELASTIC LOAD

E. SUB DISCUSSION FUNDAMENTAL
Degradation of elastic formulation, tension as result of elastic moment

F. COURSE ACTIVITY

STEPS	TIME (MINUT)	TENTOR ACTIVITY	STUDENT ACTIVITY	MEDIA AND STUDY EQUIPMENT
INTRODUCTION	15	prolog	Introducing test	Lcd, computer, white board
PRESENTATION	170	Presentation, discussion, and examination	Asking question and propose the idea	Lcd, computer, white board
CONCLUSION	150	conclusion	Asking question and propose the idea	Lcd, computer, white board

G. EVALUATION
Homework and small examination.

H. BILBILIOGRAPHY
1. *Mechanics of Materials*, SI Metric Edition, Ferdinant P. Beer, E. Russell Johnston, Jr., Mc Graw-Hill, 1987.

SET EVENT OF STUDY (SAP)

MAJOR SUBJECT TITLE: MECHANICAL OF MATERIAL STRENGTH
SUBJECT TITLE CODE : TKM 214
SKS: 3
MEETING TIME : 3 X 50 MINUT
MEETING TO : 10, 11, 12

A. INSTRUKSIONAL PURPOSE
1. GENERAL
Understand Position concept, speed, acceleration, rectilinear motion, and curve motion at field

2. SPECIAL
Recognizes and be able to calculate normal stress as result of pure shear load at solid cylindrical

B. KEMAMPUAN SOFT SKILL
Knows distribution of shear stress at cube profile.

C. STUDY METHOD
Presentation, discussion and practice

D. DISCUSSION FUNDAMENTAL
SHEAR LOAD

E. SUB DISCUSSION FUNDAMENTAL
Shear stress as result of shear load, shear stress stream

F. COURSE ACTIVITY

STEPS	TIME (MINUT)	TENTOR ACTIVITY	STUDENT ACTIVITY	MEDIA AND STUDY EQUIPMENT
INTRODUCTION	15	prolog	Introducing test	Lcd, computer, white board
PRESENTATION	170	Presentation, discussion, and examination	Asking question and propose the idea	Lcd, computer, white board
CONCLUSION	150	conclusion	Asking question and propose the idea	Lcd, computer, white board

G. EVALUATION
Homework and small examination.

H. BILBILIOGRAPHY
1. *Mechanics of Materials*, SI Metric Edition, Ferdinant P. Beer, E. Russell Johnston, Jr., Mc Graw-Hill, 1987.

SET EVENT OF STUDY (SAP)

MAJOR SUBJECT TITLE: MECHANICAL OF MATERIAL STRENGTH
SUBJECT TITLE CODE : TKM 214
SKS: 3
MEETING TIME :3 X 50 MINUT
MEETING TO : 13, 14, 15

A. INSTRUKSIONAL PURPOSE
1. GENERAL
Understand Position concept, speed, acceleration, rectilinear motion, and curve motion at field

2. SPECIAL
Be able to elaborate tension in so many corner orientations

B. KEMAMPUAN SOFT SKILL
Be able to apply Mohr's circle in main tensions calculation, and maximum shear stress

C. STUDY METHOD
Presentation, discussion and practice

D. DISCUSSION FUNDAMENTAL
STRESS TRANSFORMATION

E. SUB DISCUSSION FUNDAMENTAL
Tension transformation equation, Mohr's circle for plane stress

F. COURSE ACTIVITY

STEPS	TIME (MINUT)	TENTOR ACTIVITY	STUDENT ACTIVITY	MEDIA AND STUDY EQUIPMENT
INTRODUCTION	15	prolog	Introducing test	Lcd, computer, white board
PRESENTATION	170	Presentation, discussion, and examination	Asking question and propose the idea	Lcd, computer, white board
CONCLUSION	150	conclusion	Asking question and propose the idea	Lcd, computer, white board

G. EVALUATION
Homework and small examination.

H. BILBILIOGRAPHY
1. *Mechanics of Materials*, SI Metric Edition, Ferdinant P. Beer, E. Russell Johnston, Jr., Mc Graw-Hill, 1987.

SET EVENT OF STUDY (SAP)

MAJOR SUBJECT TITLE: MECHANICAL OF MATERIAL STRENGTH
SUBJECT TITLE CODE : TKM 214
SKS: 3
MEETING TIME : 4 X 50 MINUT
MEETING TO : 16, 17, 18

A. INSTRUKSIONAL PURPOSE
1. GENERAL
Understand Position concept, speed, acceleration, rectilinear motion, and curve motion at field

2. SPECIAL
Be able to apply simple stress analysis as result of load compound using Mohr's circle

B. KEMAMPUAN SOFT SKILL
Be able to calculate maximum active pressure at point in a profile

C. STUDY METHOD
Presentation, discussion and practice

D. DISCUSSION FUNDAMENTAL
STRESS ANALYSIS

E. SUB DISCUSSION FUNDAMENTAL
Load combination: axial load& elastic moment, elastic moment & torque

F. COURSE ACTIVITY

STEPS	TIME (MINUT)	TENTOR ACTIVITY	STUDENT ACTIVITY	MEDIA AND STUDY EQUIPMENT
INTRODUCTION	15	prolog	Introducing test	Lcd, computer, white board
PRESENTATION	170	Presentation, discussion, and examination	Asking question and propose the idea	Lcd, computer, white board
CONCLUSION	15	conclusion	Asking question and propose the idea	Lcd, computer, white board

G. EVALUATION
Homework and small examination.

H. BILBILIOGRAPHY
1. *Mechanics of Materials*, SI Metric Edition, Ferdinant P. Beer, E. Russell Johnston, Jr., Mc Graw-Hill, 1987.

SET EVENT OF STUDY (SAP)

MAJOR SUBJECT TITLE: MECHANICAL OF MATERIAL STRENGTH
SUBJECT TITLE CODE : TKM 214
SKS: 3
MEETING TIME : 3 X 50 MINUT
MEETING TO : 18, 19

A. INSTRUKSIONAL PURPOSE
1. GENERAL
Understand Position concept, speed, acceleration, rectilinear motion, and curve motion at field

2. SPECIAL
Be able to calculate active pressure at thin wall pressure vessel

B. KEMAMPUAN SOFT SKILL
Be able to estimate minimum wall thick.

C. STUDY METHOD
Presentation, discussion and practice

D. DISCUSSION FUNDAMENTAL
THIN WALL PRESSURE VESSEL

E. SUB DISCUSSION FUNDAMENTAL
Cylinder pressure vessel, ball pressure vessel

F. COURSE ACTIVITY

STEPS	TIME (MINUT)	TENTOR ACTIVITY	STUDENT ACTIVITY	MEDIA AND STUDY EQUIPMENT
INTRODUCTION	10	prolog	Introducing test	Lcd, computer, white board
PRESENTATION	120	Presentation, discussion, and examination	Asking question and propose the idea	Lcd, computer, white board
CONCLUSION	10	conclusion	Asking question and propose the idea	Lcd, computer, white board

G. EVALUATION
Homework and small examination.

H. BILBILIOGRAPHY
1. *Mechanics of Materials*, SI Metric Edition, Ferdinant P. Beer, E. Russell Johnston, Jr., Mc Graw-Hill, 1987.

SET EVENT OF STUDY (SAP)

MAJOR SUBJECT TITLE: MECHANICAL OF MATERIAL STRENGTH
SUBJECT TITLE CODE : TKM 214
SKS: 3
MEETING TIME : 6 X 50 MINUT
MEETING TO : 20, 21, 22, 23

A. INSTRUKSIONAL PURPOSE
1. GENERAL
Understand Position concept, speed, acceleration, rectilinear motion, and curve motion at field

2. SPECIAL
Be able to calculate deflection at cube for concentrated load case, distributed load, and compound load

B. KEMAMPUAN SOFT SKILL
Be able to solve reduction of buckling.

C. STUDY METHOD
Presentation, discussion and practice

D. DISCUSSION FUNDAMENTAL
DEFLECTION AT CUBE

E. SUB DISCUSSION FUNDAMENTAL
Elastic curve equation, integration method, moment wide method, energy method

F. COURSE ACTIVITY

STEPS	TIME (MINUT)	TENTOR ACTIVITY	STUDENT ACTIVITY	MEDIA AND STUDY EQUIPMENT
INTRODUCTION	15	prolog	Introducing test	Lcd, computer, white board
PRESENTATION	170	Presentation, discussion, and examination	Asking question and propose the idea	Lcd, computer, white board
CONCLUSION	150	conclusion	Asking question and propose the idea	Lcd, computer, white board

G. EVALUATION
Homework and small examination.

H. BILBILIOGRAPHY
1. *Mechanics of Materials*, SI Metric Edition, Ferdinant P. Beer, E. Russell Johnston, Jr., Mc Graw-Hill, 1987.

SET EVENT OF STUDY (SAP)

MAJOR SUBJECT TITLE: MECHANICAL OF MATERIAL STRENGTH
SUBJECT TITLE CODE : TKM 214
SKS: 3
MEETING TIME : 6 X 50 MINUT
MEETING TO : 24, 25, 26, 27

A. INSTRUKSIONAL PURPOSE
1. GENERAL
Understand Position concept, speed, acceleration, rectilinear motion, and curve motion at field

2. SPECIAL
Be able to calculate reaction forces at indefinite statist case

B. KEMAMPUAN SOFT SKILL
Realizes firmer indefinite static compared certain static.

C. STUDY METHOD
Presentation, discussion and practice

D. DISCUSSION FUNDAMENTAL
INDEFINITE STATIC AT CUBE

E. SUB DISCUSSION FUNDAMENTAL
Superposition method, transfer method, and energy method

F. COURSE ACTIVITY

STEPS	TIME (MINUT)	TENTOR ACTIVITY	STUDENT ACTIVITY	MEDIA AND STUDY EQUIPMENT
INTRODUCTION	15	prolog	Introducing test	Lcd, computer, white board
PRESENTATION	170	Presentation, discussion, and examination	Asking question and propose the idea	Lcd, computer, white board
CONCLUSION	150	conclusion	Asking question and propose the idea	Lcd, computer, white board

G. EVALUATION
Homework and small examination.

H. BILBILIOGRAPHY
1. *Mechanics of Materials*, SI Metric Edition, Ferdinant P. Beer, E. Russell Johnston, Jr., Mc Graw-Hill, 1987.

SET EVENT OF STUDY (SAP)

MAJOR SUBJECT TITLE: MECHANICAL OF MATERIAL STRENGTH
SUBJECT TITLE CODE : TKM 214
SKS: 3
MEETING TIME : 4 X 50 MINUT
MEETING TO : 28, 29, 30

A. INSTRUKSIONAL PURPOSE
1. GENERAL
Understand Position concept, speed, acceleration, rectilinear motion, and curve motion at field

2. SPECIAL
Be able to estimate critical load at simple cube

B. KEMAMPUAN SOFT SKILL
Be able to anticipate buckling influence, and dominant variable at buckling failure phenomenon.

C. STUDY METHOD
Presentation, discussion and practice

D. DISCUSSION FUNDAMENTAL
BUCKLING AT SIMPLE CUBE

E. SUB DISCUSSION FUNDAMENTAL
Buckling phenomenon, formulation of critical load for simple cube, comparison between failure buckling and failure yield

F. COURSE ACTIVITY

STEPS	TIME (MINUT)	TENTOR ACTIVITY	STUDENT ACTIVITY	MEDIA AND STUDY EQUIPMENT
INTRODUCTION	15	prolog	Introducing test	Lcd, computer, white board
PRESENTATION	170	Presentation, discussion, and examination	Asking question and propose the idea	Lcd, computer, white board
CONCLUSION	150	conclusion	Asking question and propose the idea	Lcd, computer, white board

G. EVALUATION
Homework and small examination.

H. BILBILIOGRAPHY
1. *Mechanics of Materials*, SI Metric Edition, Ferdinant P. Beer, E. Russell Johnston, Jr., Mc Graw-Hill, 1987.

GARIS-GARIS BESAR PROGRAM PEMBELAJARAN

JUDUL MATA KULIAH : Matematika Teknik II
NOMOR KODE/SKS : TKM - 221 / 3 SKS
DESKRIPSI SINGKAT : Matakuliah Matematika Teknik II membekali pengetahuan tentang: Transformasi Laplace, Transformasi dan Integral Fourier, dan Persamaan Diferensial Parsial serta aplikasinya dalam bidang rekayasa khususnya teknik mesin. Peserta matakuliah ini diharapkan telah mengikuti matakuliah TKM 211 Matematika Teknik I dan TKM 121 Aljabar Linier
TUJUAN INSTRUKSIONAL UMUM : Pada akhir kuliah mahasiswa diharapkan:
1. Memahami prinsip-prinsip transformasi Laplace, transformasi dan integral Fourier
2. Mampu memodelkan masalah rekayasa (khususnya teknik mesin) dalam bentuk persamaan diferensial parsial serta mampu menentukan Solusinya

No	TUJUAN INSTRUKSIONAL KHUSUS	POKOK BAHASAN	SUB POKOK BAHASAN	ESTIMASI WAKTU (MENIT)	METODE PEMBELAJARAN	KEMAMPUAN SOFT SKILL	SUMBER KEPUSTAKAAN
1	- Understanding Laplace transform and its application for standard function	Laplace transform	- Standard function standard - Differential and integral Transform - Partial fraction - Convolution method	150	- Presentation - Discussion - Self-supproting activity	- Ability for giving opinion - Ability for understanding others opinion - Ability for self-supporting activity	Pustaka 1
2	- Understanding Fourier series and able to periodic function approach with trigonometry series	Fourier series	- Periodic and trigonometry function - Euler formulation - Random periodic Function - Even, Odd functionwith half I expansion	150	- Presentation - Discussion - Self-supproting activity	- Ability for giving opinion - Ability for understanding others opinion - Ability for self-supporting activity	Pustaka 1
3	- Able to understand and determine integral function	Fourier Integral	- Periodic and non-periodic function - Fourier Integral Odd and Even function	150	- Presentation - Discussion - Self-supproting activity	- Ability for giving opinion - Ability for understanding others opinion - Ability for self-supporting activity	Pustaka 1
4	- Understanding and determining integral function which has been given	Fourier Transformation	- Fourier Tranformation - Discrete Fourier Transform - Fast Fourier Transform	150	- Presentation - Discussion - Self-supproting activity	- Ability for giving opinion - Ability for understanding others opinion - Ability for self-supporting activity	Pustaka 1
5	- Able to determine ODE solution with Laplace and F ourier Transform	Simple differential equation using Laplace and Fourier Transform	- ODE solution using Laplace transform - ODE solution using Fourier transform	150	- Presentation - Discussion - Self-supproting activity	- Ability for giving opinion - Ability for understanding others opinion - Ability for self-supporting	Pustaka 1

						activity	
6	- Understand PDE form and characteristic - Able to modeling vibration equation on rope and giving solution using variable separation method	PDE 1: Ropes Vibration	- PDE definition - 1st D waves equation - Ropes vibration using variable separation method	150	- Presentation - Discussion - Self-supproting activity	- Ability for giving opinion - Ability for understanding others opinion - Ability for self-supporting activity	Pustaka 1 & 2
7	- Understand PDE form and characteristic - Able to modeling vibration equation on bar which get axial vibration, torque, and transversal also able to determine natural frequency and modus shape for various boundary layer	PDE 2: Bar Vibration	- Bar Vibration - Axial vibration - Torque vibration - Transversal vibration	150	- Presentation - Discussion - Self-supproting activity	- Ability for giving opinion - Ability for understanding others opinion - Ability for self-supporting activity	Pustaka 1 & 2
8	- Understand PDE form and characteristic - Able to heat flow equation on bar for various condition and able to find its solution	PDE 3: 1-D heat flow	- Heat flow on finite bar - Heat flow on semi nonfinite bar - Heat flow on nonfinite bar (Fourier Integral)	150	- Presentation - Discussion - Self-supproting activity	- Ability for giving opinion - Ability for understanding others opinion - Ability for self-supporting activity	Pustaka 1 & 2
9	- Understand PDE form and characteristic - Able to modelling vibration equation on membrane for various condition and able to find its solution	PDE 4: Membrane vibration	- Rectangular membrane vibration - Circular membrane vibration	150	- Presentation - Discussion - Self-supproting activity	- Ability for giving opinion - Ability for understanding others opinion - Ability for self-supporting activity	Pustaka 1 & 2
10	- Able to modelling heat flow on plate and beam also able to find its solution	PDE 5: 2 and 3D Heat flow	- Heat flow on plate - Beam chilling	150	- Presentation - Discussion - Self-supproting activity	- Ability for giving opinion - Ability for understanding others opinion - Ability for self-supporting activity	Pustaka 1 & 2
11	- Understand Laplace equation characteristic and able to find its solution	PDE 7: Laplace equation	- Laplace equation on Cartesian coordinates - 2 and 3D steady flow equation	150	- Presentation - Discussion - Self-supproting activity	- Ability for giving opinion - Ability for understanding others opinion - Ability for self-supporting activity	Pustaka 1 & 2
12	- Able to use Laplace and Fourier Transform to solve PDE	PDE solution using Laplace and Fourier transform	- PDE solution using Laplace transform - PDE solution using Fourier transform	150	- Presentation - Discussion - Self-supproting activity	- Ability for giving opinion - Ability for understanding others opinion - Ability for self-supporting	Pustaka 1 & 2

						activity	

Pustaka :

1. Kreyszig, E.; *Advanced Engineering Mathemathics*, 9th ed. John Wiley & Sohns
2. Haryanto, I.; *Modul Kuliah Matematika Teknik II*, Teknik Mesin UNDIP, 2007

STANDARD COURSE OUTLINE

Subject : 1ST **ENGINEERING MATHEMATICS**
Subject Code : TKM 211
Subject Credit : 3
Class schedule : 2 x 75 minutes
Lecture : 1st

A. Course Objective
1. General Objective : Student have the ability to solve differential equation which can be seen on mechanical engineering field, vibration technique, heat transfer, fluid mechanics, thermodynamics, heat exchanger, refrigeration, turbine, etc.
2. Specific Objective : student have the ability to understand, doing problem exercise and find the right answer

B. Desirable student competencies:
Systematical thinking in real life, and to choose the right decisions

C. Course Method:
Presentation, Question and answer, problem exercise.

D. Main course description:
1st order differential equation

E. Sub Course description:
Modelling: 1st order differential equation

F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of differential equation	Listening	LCD White board Computer
2	PRESENTATION	130	Problem exercise and solving, application	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

G. Method of assessment
Home Work

H. Text Book

1. Erwin Kreyzig, *Advanced Engineering Mathematics*, John Willey&Sons, New York, 1987
2. N Piskunov, *Deffrential and Calculus Vol II*, Mir Publisher, Moscow, 1980
3. Murray R Spiegel, *Advanced Mathematicsfor Engineers & Scientists*, Mc Graw Hill Book Co, New York, 1990

STANDARD COURSE OUTLINE

Subject : 1ST **ENGINEERING MATHEMATICS**
Subject Code : TKM 211
Subject Credit : 3
Class schedule : 2 x 75 minutes
Lecture : 2nd

A. Course Objective
1. General Objective : Student have the ability to solve differential equation which can be seen on mechanical engineering field, vibration technique, heat transfer, fluid mechanics, thermodynamics, heat exchanger, refrigeration, turbine, etc.
2. Specific Objective : student have the ability to understand, doing problem exercise and find the right answer

B. Desirable student competencies:
Systematical thinking in real life, and to choose the right decisions

C. Course Method:
Presentation, Question and answer, problem exercise.

D. Main course description:
1st order differential equation

E. Sub Course description:
Modelling: 1st order linear differential equation and Bernoulli differential equation

F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of differential equation	Listening	LCD White board Computer
2	PRESENTATION	130	Problem exercise and solving, application	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

G. Method of assessment
Home Work

H. Text Book

1. Erwin Kreyzig, *Advanced Engineering Mathematics*, John Willey&Sons, New York, 1987
2. N Piskunov, *Deffrential and Calculus Vol II*, Mir Publisher, Moscow, 1980
3. Murray R Spiegel, *Advanced Mathematicsfor Engineers & Scientists*, Mc Graw Hill Book Co, New York, 1990

STANDARD COURSE OUTLINE

Subject : 1ST **ENGINEERING MATHEMATICS**
Subject Code : TKM 211
Subject Credit : 3
Class schedule : 2 x 75 minutes
Lecture : 3rd

A. Course Objective
1. General Objective : Student have the ability to solve differential equation which can be seen on mechanical engineering field, vibration technique, heat transfer, fluid mechanics, thermodynamics, heat exchanger, refrigeration, turbine, etc.
2. Specific Objective : student have the ability to understand, doing problem exercise and find the right answer

B. Desirable student competencies:
Systematical thinking in real life, and to choose the right decisions

C. Course Method:
Presentation, Question and answer, problem exercise.

D. Main course description:
1st order differential equation

E. Sub Course description:
Modelling: exact differential equations and integral factor

F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of differential equation	Listening	LCD White board Computer
2	PRESENTATION	130	Problem exercise and solving, application	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

G. Method of assessment
Home Work

H. Text Book

1. Erwin Kreyzig, *Advanced Engineering Mathematics*, John Willey&Sons, New York, 1987
2. N Piskunov, *Deffrential and Calculus Vol II*, Mir Publisher, Moscow, 1980
3. Murray R Spiegel, *Advanced Mathematicsfor Engineers & Scientists*, Mc Graw Hill Book Co, New York, 1990

STANDARD COURSE OUTLINE

Subject : 1ST **ENGINEERING MATHEMATICS**
Subject Code : TKM 211
Subject Credit : 3
Class schedule : 2 x 75 minutes
Lecture : 4th

A. Course Objective
1. General Objective : Student have the ability to solve differential equation which can be seen on mechanical engineering field, vibration technique, heat transfer, fluid mechanics, thermodynamics, heat exchanger, refrigeration, turbine, etc.
2. Specific Objective : student have the ability to understand, doing problem exercise and find the right answer

B. Desirable student competencies:
Systematical thinking in real life, and to choose the right decisions

C. Course Method:
Presentation, Question and answer, problem exercise.

D. Main course description:
2nd order differential equation, homogeneous linear coefficient

E. Sub Course description:
Modelling: 2nd order differential equation, linear homogenenous coefficient with 3 alternative answer

F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of differential equation	Listening	LCD White board Computer
2	PRESENTATION	130	Problem exercise and solving, application	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

G. Method of assessment
Home Work

H. Text Book

1. Erwin Kreyzig, *Advanced Engineering Mathematics*, John Willey&Sons, New York, 1987
2. N Piskunov, *Deffrential and Calculus Vol II*, Mir Publisher, Moscow, 1980
3. Murray R Spiegel, *Advanced Mathematicsfor Engineers & Scientists*, Mc Graw Hill Book Co, New York, 1990

STANDARD COURSE OUTLINE

Subject : 1ST **ENGINEERING MATHEMATICS**
Subject Code : TKM 211
Subject Credit : 3
Class schedule : 2 x 75 minutes
Lecture : 6th

A. Course Objective
1. General Objective : Student have the ability to solve differential equation which can be seen on mechanical engineering field, vibration technique, heat transfer, fluid mechanics, thermodynamics, heat exchanger, refrigeration, turbine, etc.
2. Specific Objective : student have the ability to understand, doing problem exercise and find the right answer

B. Desirable student competencies:
Systematical thinking in real life, and to choose the right decisions

C. Course Method:
Presentation, Question and answer, problem exercise.

D. Main course description:
3rd order differential equation, non-homogeneous linear coefficient

E. Sub Course description:
Modelling: 3rd order differential equation, with linear 3rdorder complex roots

F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of differential equation	Listening	LCD White board Computer
2	PRESENTATION	130	Problem exercise and solving, application	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

G. Method of assessment
Home Work

H. Text Book

1. Erwin Kreyzig, *Advanced Engineering Mathematics*, John Willey&Sons, New York, 1987
2. N Piskunov, *Deffrential and Calculus Vol II*, Mir Publisher, Moscow, 1980
3. Murray R Spiegel, *Advanced Mathematicsfor Engineers & Scientists*, Mc Graw Hill Book Co, New York, 1990

STANDARD COURSE OUTLINE

Subject : 1ST **ENGINEERING MATHEMATICS**
Subject Code : TKM 211
Subject Credit : 3
Class schedule : 2 x 75 minutes
Lecture : 7th

A. Course Objective
1. General Objective : Student have the ability to solve differential equation which can be seen on mechanical engineering field, vibration technique, heat transfer, fluid mechanics, thermodynamics, heat exchanger, refrigeration, turbine, etc.
2. Specific Objective : student have the ability to understand, doing problem exercise and find the right answer

B. Desirable student competencies:
Systematical thinking in real life, and to choose the right decisions

C. Course Method:
Presentation, Question and answer, problem exercise.

D. Main course description:
4th order differential equation, non-homogeneous linear coefficient

E. Sub Course description:
Modelling: 4th order differential equation, with linear 4th order complex roots

F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of differential equation	Listening	LCD White board Computer
2	PRESENTATION	130	Problem exercise and solving, application	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

G. Method of assessment
Home Work

H. Text Book

1. Erwin Kreyzig, *Advanced Engineering Mathematics*, John Willey&Sons, New York, 1987
2. N Piskunov, *Deffrential and Calculus Vol II*, Mir Publisher, Moscow, 1980
3. Murray R Spiegel, *Advanced Mathematicsfor Engineers & Scientists*, Mc Graw Hill Book Co, New York, 1990

STANDARD COURSE OUTLINE

Subject : 1ST **ENGINEERING MATHEMATICS**
Subject Code : TKM 211
Subject Credit : 3
Class schedule : 2 x 75 minutes
Lecture : 8th

A. Course Objective
1. General Objective : Student have the ability to solve differential equation which can be seen on mechanical engineering field, vibration technique, heat transfer, fluid mechanics, thermodynamics, heat exchanger, refrigeration, turbine, etc.
2. Specific Objective : student have the ability to understand, doing problem exercise and find the right answer

B. Desirable student competencies:
Systematical thinking in real life, and to choose the right decisions

C. Course Method:
Presentation, Question and answer, problem exercise.

D. Main course description:
Higher order diferential equation with complex roots

E. Sub Course description:
Cases of complex roots

F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of differential equation	Listening	LCD White board Computer
2	PRESENTATION	130	Problem exercise and solving, application	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

G. Method of assessment
Home Work

H. Text Book

1. Erwin Kreyzig, *Advanced Engineering Mathematics*, John Willey&Sons, New York, 1987
2. N Piskunov, *Deffrential and Calculus Vol II*, Mir Publisher, Moscow, 1980
3. Murray R Spiegel, *Advanced Mathematicsfor Engineers & Scientists*, Mc Graw Hill Book Co, New York, 1990

STANDARD COURSE OUTLINE

Subject : 1ST **ENGINEERING MATHEMATICS**
Subject Code : TKM 211
Subject Credit : 3
Class schedule : 2 x 75 minutes
Lecture : 9th

A. Course Objective
1. General Objective : Student have the ability to solve differential equation which can be seen on mechanical engineering field, vibration technique, heat transfer, fluid mechanics, thermodynamics, heat exchanger, refrigeration, turbine, etc.
2. Specific Objective : student have the ability to understand, doing problem exercise and find the right answer

B. Desirable student competencies:
Systematical thinking in real life, and to choose the right decisions

C. Course Method:
Presentation, Question and answer, problem exercise.

D. Main course description:
Simultaneous 1st order differential equation

E. Sub Course description:
Cases of 1st order differential equation

F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of differential equation	Listening	LCD White board Computer
2	PRESENTATION	130	Problem exercise and solving, application	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

G. Method of assessment
Home Work

H. Text Book

1. Erwin Kreyzig, *Advanced Engineering Mathematics*, John Willey&Sons, New York, 1987
2. N Piskunov, *Deffrential and Calculus Vol II*, Mir Publisher, Moscow, 1980
3. Murray R Spiegel, *Advanced Mathematicsfor Engineers & Scientists*, Mc Graw Hill Book Co, New York, 1990

STANDARD COURSE OUTLINE

Subject : 1ST **ENGINEERING MATHEMATICS**
Subject Code : TKM 211
Subject Credit : 3
Class schedule : 2 x 75 minutes
Lecture : 10th

A. Course Objective
1. General Objective : Student have the ability to solve differential equation which can be seen on mechanical engineering field, vibration technique, heat transfer, fluid mechanics, thermodynamics, heat exchanger, refrigeration, turbine, etc.
2. Specific Objective : student have the ability to understand, doing problem exercise and find the right answer

B. Desirable student competencies:
Systematical thinking in real life, and to choose the right decisions

C. Course Method:
Presentation, Question and answer, problem exercise.

D. Main course description:
Simultaneous 2nd order differential equation

E. Sub Course description:
Cases of 2nd order differential equation

F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of differential equation	Listening	LCD White board Computer
2	PRESENTATION	130	Problem exercise and solving, application	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

G. Method of assessment
Home Work

H. Text Book

1. Erwin Kreyzig, *Advanced Engineering Mathematics*, John Willey&Sons, New York, 1987
2. N Piskunov, *Deffrential and Calculus Vol II*, Mir Publisher, Moscow, 1980
3. Murray R Spiegel, *Advanced Mathematicsfor Engineers & Scientists*, Mc Graw Hill Book Co, New York, 1990

STANDARD COURSE OUTLINE

Subject : 1ST **ENGINEERING MATHEMATICS**
Subject Code : TKM 211
Subject Credit : 3
Class schedule : 2 x 75 minutes
Lecture : 11th

A. Course Objective
1. General Objective : Student have the ability to solve differential equation which can be seen on mechanical engineering field, vibration technique, heat transfer, fluid mechanics, thermodynamics, heat exchanger, refrigeration, turbine, etc.
2. Specific Objective : student have the ability to understand, doing problem exercise and find the right answer

B. Desirable student competencies:
Systematical thinking in real life, and to choose the right decisions

C. Course Method:
Presentation, Question and answer, problem exercise.

D. Main course description:
Simultaneous higher order differential equation

E. Sub Course description:
Cases of higher order differential equation

F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of differential equation	Listening	LCD White board Computer
2	PRESENTATION	130	Problem exercise and solving, application	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

G. Method of assessment
Home Work

H. Text Book

1. Erwin Kreyzig, *Advanced Engineering Mathematics*, John Willey&Sons, New York, 1987
2. N Piskunov, *Deffrential and Calculus Vol II*, Mir Publisher, Moscow, 1980
3. Murray R Spiegel, *Advanced Mathematicsfor Engineers & Scientists*, Mc Graw Hill Book Co, New York, 1990

STANDARD COURSE OUTLINE

Subject : 1ST **ENGINEERING MATHEMATICS**
Subject Code : TKM 211
Subject Credit : 3
Class schedule : 2 x 75 minutes
Lecture : 12th

A. Course Objective
1. General Objective : Student have the ability to solve differential equation which can be seen on mechanical engineering field, vibration technique, heat transfer, fluid mechanics, thermodynamics, heat exchanger, refrigeration, turbine, etc.
2. Specific Objective : student have the ability to understand, doing problem exercise and find the right answer

B. Desirable student competencies:
Systematical thinking in real life, and to choose the right decisions

C. Course Method:
Presentation, Question and answer, problem exercise.

D. Main course description:
Simultaneous higher order differential equation

E. Sub Course description:
Cases of higher order differential equation with complex roots

F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of differential equation	Listening	LCD White board Computer
2	PRESENTATION	130	Problem exercise and solving, application	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

G. Method of assessment
Home Work

H. Text Book

1. Erwin Kreyzig, *Advanced Engineering Mathematics*, John Willey&Sons, New York, 1987
2. N Piskunov, *Deffrential and Calculus Vol II*, Mir Publisher, Moscow, 1980
3. Murray R Spiegel, *Advanced Mathematicsfor Engineers & Scientists*, Mc Graw Hill Book Co, New York, 1990

STANDARD COURSE OUTLINE

Subject : 1ST **ENGINEERING MATHEMATICS**
Subject Code : TKM 211
Subject Credit : 3
Class schedule : 2 x 75 minutes
Lecture : 13th

A. Course Objective
1. General Objective : Student have the ability to solve differential equation which can be seen on mechanical engineering field, vibration technique, heat transfer, fluid mechanics, thermodynamics, heat exchanger, refrigeration, turbine, etc.
2. Specific Objective : student have the ability to understand, doing problem exercise and find the right answer

B. Desirable student competencies:
Systematical thinking in real life, and to choose the right decisions

C. Course Method:
Presentation, Question and answer, problem exercise.

D. Main course description:
Gamma function

E. Sub Course description:
Modelling: Gamma function

F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of differential equation	Listening	LCD White board Computer
2	PRESENTATION	130	Problem exercise and solving, application	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

G. Method of assessment
Home Work

H. Text Book

1. Erwin Kreyzig, *Advanced Engineering Mathematics*, John Willey&Sons, New York, 1987
2. N Piskunov, *Deffrential and Calculus Vol II*, Mir Publisher, Moscow, 1980
3. Murray R Spiegel, *Advanced Mathematicsfor Engineers & Scientists*, Mc Graw Hill Book Co, New York, 1990

STANDARD COURSE OUTLINE

Subject : 1ST **ENGINEERING MATHEMATICS**
Subject Code : TKM 211
Subject Credit : 3
Class schedule : 2 x 75 minutes
Lecture : 14th

A. Course Objective
1. General Objective : Student have the ability to solve differential equation which can be seen on mechanical engineering field, vibration technique, heat transfer, fluid mechanics, thermodynamics, heat exchanger, refrigeration, turbine, etc.
2. Specific Objective : student have the ability to understand, doing problem exercise and find the right answer

B. Desirable student competencies:
Systematical thinking in real life, and to choose the right decisions

C. Course Method:
Presentation, Question and answer, problem exercise.

D. Main course description:
Beta function

E. Sub Course description:
Modelling: Beta function

F. Course Activity:

No	PROGRESSION	TIME ESTIMATION	LECTURER ACTIVITY	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General introduction of differential equation	Listening	LCD White board Computer
2	PRESENTATION	130	Problem exercise and solving, application	Asking & Giving opinion	LCD White board Color marker
3	CLOSING	10	Giving course conclusion	Q &A	LCD White board Color marker

G. Method of assessment
Home Work

H. Text Book

1. Erwin Kreyzig, *Advanced Engineering Mathematics*, John Willey&Sons, New York, 1987
2. N Piskunov, *Deffrential and Calculus Vol II*, Mir Publisher, Moscow, 1980
3. Murray R Spiegel, *Advanced Mathematicsfor Engineers & Scientists*, Mc Graw Hill Book Co, New York, 1990

GARIS-GARIS BESAR PROGRAM PEMBELAJARAN (GBPP)

Judul Mata Kuliah : **Getaran Mekanis**

Nomor Kode/SKS : TKM 223 / 3 SKS

Informasi Singkat :

1. Mata kuliah ini merupakan mata kuliah wajib dengan prasyarat telah mengikuti mata kuliah Statika Struktur, Teori Kekuatan Material, dan Kinematika Dinamika
2. Mata kuliah ini sebagai dasar untuk mengikuti mata kuliah Elemen Mesin, Perancangan Produk dan Metode Elemen Hingga
3. Alat Bantu ajar yang digunakan (disesuaikan kondisi : White Board, OHP, In-Focus dan komputer)
4. Kehadiran mahasiswa minimal 75%
5. Mahasiswa diharuskan membaca buku pegangan wajib dan dianjurkan membaca buku yang disarankan
6. Proses pembelajaran meliputi : tatap muka di kelas, pekerjaan rumah, dan ujian/test

Tujuan Instruksional Umum (TIU)

Kuliah ini akan memberikan gambaran kepada mahasiswa tentang penerapan dari hukum Newton II dan Hukum Kelestarian Energi dalam pemodelan mekanika yang dipakai untuk memecahkan persoalan getaran. Disamping itu juga untuk menambah apresiasi keilmuan khususnya ilmu mekanika , matematika, dan komputasi.

No.	Tujuan Instruksional Khusus (TIK)	Pokok Bahasan	Sub Pokok Bahasan	Estimasi Waktu (menit)	Metode Pembelajaran	Kemampuan Soft Skill	Sumber Kepustakaan
1	Mahasiswa mahir mendeskripsikan gerakan dengan memilih sistim koordinat yang tepat, mahir membangun persamaan differential gerak dari sistim yang bergetar periodic dengan menerapkan Hk. Newton II untuk SDOF system	Periodic Motion SDOF	Coordinates, Free Vibration, Harmonic Motion, Torsional Vibration, Compound Pendulum, Fillar Pendulum	3 x 50	Ceramah, diskusi/ tanya jawab dan tugas PR	Mahasiswa mampu membayangkan dan menganalisa gerak sistim yang bergetar periodic pada SDOF	1
2	Mahasiswa mampu menggunakan hukum kelestarian energi untuk menurunkan persamaan gerak, dan mampu memilih datum yang tepat pada SDOF system	Metode Energi Pada Analisa Getaran SDOF	Energy Methods, Single Degree of Freedom, The Selection of the Datum, Mode shape, Distributed parameters, Lumped System	3 x 50	Ceramah, diskusi/ tanya jawab dan tugas PR	Mahasiswa mampu membayangkan dan menganalisa gerak sistim yang bergetar pada SDOF dengan metode energi	1
3	Mahasiswa mahir menghitung respon yang terjadi akibat eksitasi harmonis sederhana dan memahami adanya fenomena resonansi pada SDOF system	Forced Periodic Motion	Undamped Forced Harmonic Vibration, Vibration Measuring Instrument, Harmonic Analysis	3 x 50	Ceramah, diskusi/ tanya jawab dan tugas PR	Mahasiswa mampu membayangkan dan menganalisa gerak periodic sistim SDOF yang bergetar paksa	1
4	Mahasiswa mahir menghitung respon yang terjadi akibat eksitasi harmonis yang tidak sederhana. pada sistim getaran paksa SDOF	Initial Conditions and Transient Vibration	The Rectangular Step Forcing Function, Ramp, Exponentially, Combination of Forcing Function Sambungan	2 x 60	Pemberian soal essai dalam bentuk buku tertutup	Mahasiswa mampu mengestimasi initial conditions dan menganalisa getaran transient pada sistim getaran paksa SDOF	1
5	Mahasiswa mengenal berbagai macam model redaman dan mahir mengiplementasikannya dalam perhitungan. pada sistim getaran bebas maupun paksa SDOF	Berbagai Macam Redaman	Viscous Damping, Hysteretic Damping, Complex Damping, Coulomb Damping	3 x 50	Ceramah, diskusi/ tanya jawab dan tugas PR	Mahasiswa mampu membayangkan gerak sistim yang bergetar teredam pada kasus SDOF	1

No.	Tujuan Instruksional Khusus (TIK)	Pokok Bahasan	Sub Pokok Bahasan	Estimasi Waktu (menit)	Metode Pembelajaran	Kemampuan Soft Skill	Sumber Kepustakaan
6	Mahasiswa mahir menghitung respon yang terjadi akibat eksitasi harmonis sederhana pada sistem yang mengandung berbagai model redaman dan memahami adanya fenomena resonansi pada sistim getaran bebas maupun paksa SDOF	Damped Forced Vibration	Forced Damped Harmonic Vibration, Rotating Unbalanced, Vibration Isolation, Seismic Instrument, Forced Harmonic Vibration With Hysteresis Damping, With Dry Friction Damping, Eqeuivalent Viscous Damping	3 x 50	Ceramah, diskusi/ tanya jawab dan tugas PR	Mahasiswa mampu menges-timasi respon dinamik sistim yang bergetar teredam pada kasus SDOF	1
7	Mahasiswa memahami berbagai bentuk dasar dari persamaan gerak yang tidak linear dan mampu memecahkan untuk kasus-kasus yang sederhana pada sistim getaran bebas maupun paksa SDOF	Non-Linear Vibration SDOF	Linearity & Nonlinearity, Discontinuos Nonlinearity, Linearization by approximation, forced Vibration of Non Linear System	3 x 50	Ceramah, diskusi/ tanya jawab dan tugas PR	Mahasiswa mampu menges-timasi persamaan gerak sistim non-liner pada kasus getaran SDOF	1
8	Mengukur kemampuan mahasiswa setelah mengikuti perkuliahan 1 s/d 7	Test ke-1	Materi perkuliahan tatap muka 1 s/d 7	2 x 60	Pemberian soal essai dalam bentuk buku tertutup	Mahasiswa telah membaca dan mengingat materi yang telah diberikan sebelumnya, mendengar/menyimak dengan seksama materi yang disampaikan dan mampu menyarikan apa yang disampaikan dosen	1
9	Mahasiswa mengenal dan memahami perbedaan yang mendasar antara sistem satu derajat kebebasan dengan sistem multi derajat kebebasan, mahir dalam membangun persamaan gerak dan mampu memecahkannya serta menyadari kegunaan dinamik absorber dalam kehidupan sehari-hari	Sistim Getaran TDOF	Free Vibration and Frequency Equation, Modes and Modal Fraction, Principle Coordinates for TOD, Coupled Modes and Coupled Coordinates, Rayleigh's Principle, Dynamic Vibration Absorbers, Transmission of Forces	3 x 50	Ceramah, diskusi/ tanya jawab dan tugas PR	Mahasiswa mampu menges-timasi persamaan gerak sistim pada kasus getaran TDOF	1

No.	Tujuan Instruksional Khusus (TIK)	Pokok Bahasan	Sub Pokok Bahasan	Estimasi Waktu (menit)	Metode Pembelajaran	Kemampuan Soft Skill	Sumber Kepustakaan
10	Mahasiswa mahir dalam membangun persamaan gerak dan mampu memecahkannya.pada kasus getaran torsional TDOF	Torsional Vibration TDOF	Discrete Systems, Torsional Vibration, Holzer's Method, Kinematically Equivalent system, Forced Vibration of Torsional System	3 x 50	Ceramah, diskusi/ tanya jawab dan tugas PR	Mahasiswa mampu menges-timasi persamaan gerak sistim getaran torsional TDOF	1
11	Mahasiswa mengenal dan memahami tahapan dalam pemodelan diskrit serta mampu mengoperasikannya ke dalam komputer	Sistim Diskret	Analisis Dengan Metode Matriks dan Metode Elemen Hingga	3 x 50	Ceramah, diskusi/ tanya jawab dan tugas PR	Mahasiswa mampu menges-timasi gerak sistim diskret dengan menggunakan meto-de matriks dan FEM	1, 2
12	Mengukur kemampuan mahasiswa setelah mengikuti perkuliahan 9 s/d 11	Test ke-2	Materi perkuliahan tatap muka 9 s/d 11	2 x 60	Pemberian soal essai dalam bentuk buku tertutup	Mahasiswa telah membaca dan mengingat materi yang telah diberikan sebelumnya, mendengar/menyimak de-ngan seksama materi yang disampaikan dan mampu menyarikan apa yang disampaikan dosen	1, 2
13	Mahasiswa mengetahui perbedaan yang mendasar antara pendekatan diskrit dan kontinyu dan mampu membangun dan menentukan solusi untuk sistem kontinyu	Distributed Systems	Wave Equation, Transverse Vibration of Uniform Beams, Rotation and Shear Effects, The Effect of Axial Loading	3 x 50	Ceramah, diskusi/ tanya jawab dan tugas PR	Mahasiswa mampu memba-yangkan gerak sistim kon-tinu dan mampu memo-delkannya dalam bentuk distributed systems	1
14	Mahasiswa mengenal dan memahami aspek getaran acak dalam kasus schari-hari serta mampu melakukan pendekatan untuk menentukan solusi	Sistim Getaran Acak	Random Vibration in SDOF, Response to Ran-dom Exitation	3 x 50	Ceramah, diskusi/ tanya jawab dan tugas PR	Mahasiswa mampu mensi-mulasikan gerak sistim getaran acak dan mampu menerapkannya dalam kasus riil	1

No.	Tujuan Instruksional Khusus (TIK)	Pokok Bahasan	Sub Pokok Bahasan	Estimasi Waktu (menit)	Metode Pembelajaran	Kemampuan Soft Skill	Sumber Kepustakaan
15	Mahasiswa mampu melakukan analisis modal baik menggunakan FRF, Bode Diagram, Nyquist, SISO maupun MIMO	Introduction to Modal Analysis	FRF, Bode Diagram, Nyquist, SISO, MIMO	3 x 50	Ceramah, diskusi/ tanya jawab dan tugas PR	Mahasiswa telah membaca dan mengingat materi yang telah diberikan sebelumnya, mendengar/menyimak dengan seksama materi yang disampaikan dan mampu menyarikan apa yang disampaikan dosen	5
16	Mengukur kemampuan mahasiswa setelah mengikuti seluruh perkuliahan Elemen Mesin I	Ujian Akhir	Seluruh materi perkuliahan yang telah diberikan	2 x 60	Pemberian soal esai dalam bentuk buku tertutup	Mahasiswa telah membaca dan mengingat materi yang telah diberikan sebelumnya, mendengar/menyimak dengan seksama materi yang disampaikan dan mampu menyarikan apa yang disampaikan dosen	1, 2, 5

Kepustakaan :

Wajib : 1. Steidel, Robert, F., Jr., *Introduction to Mechanical Vibrations* , 3 rd . Ed., John Willey & Sons, Ink, 1988.

2. James, M. L., Smith, G. M., Wolford, J. C., Whaley, P. P., *Vibration of Mechanical and Struktural Systems with Microcomputer Applications*, 2 nd. Ed., Harper Collins College Publishers, 1994.

Anjuran : 3. Timhoshenko, S., Young, D. H., and Weaver, W., Jr., *Vibration Problems in Engineering*, 4 th Ed., Wiley, 1974.

4. Den Hartog, J.P., *Mechanical Vibration*, Mc Graw - Hill, 1958.

5. Thomson, W. T., *Theory of Vibrations with Applications*, 3rd Ed., Prantice- Hall, 1988.

SAP

Subject : **MECHANICAL VIBRATION**
Subject Code : TKM 223
Subject Credit : 3
Class Schedule : 3x50 minutes
Lecture : 1st

A. Course Objective
General Objective : Students can understand how to analyze periodic motion on Single degree of freedom vibration
Specific Objective : Students able to explaining motion and to choose the right coordinate, make moving differential equation from periodic vibration using 2nd Newton law for SDOF system

B. Desirable student competencies:
Student able to conceive and analyze periodic system of vibration on SDOF
C. Course Method : 1. Presentation
2. Discussion/ Q & A
3. Home Work

D. Main course description : Periodic Motion SDOF
E. Sub Course description : Coordinates, Free Vibration, Harmonic Motion, Torsional Vibration, Compound Pendulum, Fillar Pendulum

F. Course Activity:

No.	Progress	Time	Lecturer activity	Student activity	Course Appliances
1.	INTRODUCTION	25 minutes	1. explaining course material and references 2. explaining course regulation 3.explaining TIU and TIK	Paying attention and asking	Computer, LCD Projector and White Board
2.	PRESENTATION	2 x 50 minutes	1. explaining coure scope of mechanical vibration SDOF 2. explaining how to choose coordinates and to make differential equation SDOF of mechanical vibration 3. explaining how to make differential equation of harmonic vibration and torque 4. explaining how to make differential equation of compound pendulum and Fillar pendulum 5. Problem solving	Paying attention and asking	Computer, LCD Projector and White Board

			6. Problem exercise		
3.	CLOSING	25 minutes	1. Give Course Conclusion 2. Give Homework	Paying attention and asking	Computer, LCD Projector and White Board

G. Method of assessment : 1. Home Works
2. Mid Exam
3. Final Exam

H.Text Book :

Obliged :1.Steidel, Robert, F., Jr., *Introduction to Mechanical Vibrations* , 3 rd . Ed., John Willey & Sons, Ink, 1988.

2. James, M. L., Smith, G. M., Wolford, J. C., Whaley, P. P., *Vibration of Mechanical and Struktural Systems with Microcomputer Applications*, 2 nd. Ed., Harper Collins College Publishers, 1994.

Suggestion :

3.Timhoshenko, S., Young, D. H., and Weaver, W., Jr., *Vibration Problems in Engineering*, 4 th Ed., Wiley, 1974.

4. Den Hartog, J.P., *Mechanical Vibration*, Mc Graw - Hill, 1958.

5. Thomson, W. T., *Theory of Vibrations with Applications*, 3rd Ed., Prantice- Hall, 1988.

SAP

Subject : **Mechanical Vibration**
Subject Code : TKM 223
Subject Credit : 3
Class Schedule : 3x50 minutes
Lecture : 2nd

A. Course Objective
General Objective : Students can understand how to use method of energy to analyze Single degree of freedom vibration
Specific Objective : Students able to use energy conservation law to decrease motion equation also to choose the right datum on SDOF system

B. Desirable student competencies:
Student able to conceive and analyze periodic system of vibration on SDOF using method of energy

C. Course Method : 1. Presentation
2. Discussion/ Q & A
3. Home Work

D. Main course description : Method of energy on Periodic Motion SDOF
E. Sub Course description : Energy Methods, Single Degree of Freedom, The Selection of the Datum, Mode shape, Distributed parameters, Lumped System

F. Course Activity:

No.	Progress	Time	Lecturer activity	Student activity	Course Appliances
1.	INTRODUCTION	10 minutes	1. explaining course material and references	Paying attention and asking	Computer, LCD Projector and White Board
2.	PRESENTATION	2 x 50 minutes	1. explaining the concept of energy method to analyze mechanical vibration SDOF 2. explaining how to choose the right datum and make an free vibration energy conservation equation of SDOF 3. Explaining mode system on SDOF free vibration system 4. Explaining distributed parameter and lumped system on a free vibration system SDOF 5. Problem solving	Paying attention and asking	Computer, LCD Projector and White Board

			6. Problem exercise		
3.	CLOSING	20 minutes	1. Give Course Conclusion 2. Give Homework	Paying attention and asking	Computer, LCD Projector and White Board

G. Method of assessment : 1. Home Works
2. Mid Exam
3. Final Exam

H.Text Book :

Obliged :1.Steidel, Robert, F., Jr., *Introduction to Mechanical Vibrations* , 3 rd . Ed., John Willey & Sons, Ink, 1988.

2. James, M. L., Smith, G. M., Wolford, J. C., Whaley, P. P., *Vibration of Mechanical and Struktural Systems with Microcomputer Applications*, 2 nd. Ed., Harper Collins College Publishers, 1994.

Suggestion :

3.Timhoshenko, S., Young, D. H., and Weaver, W., Jr., *Vibration Problems in Engineering*, 4 th Ed., Wiley, 1974.

4. Den Hartog, J.P., *Mechanical Vibration*, Mc Graw - Hill, 1958.

5. Thomson, W. T., *Theory of Vibrations with Applications*, 3rd Ed., Prantice- Hall, 1988.

SAP

Subject : **Mechanical Vibration**
Subject Code : TKM 223
Subject Credit : 3
Class Schedule : 3x50 minutes
Lecture : 3nd

A. Course Objective
General Objective : Students can understand periodic motion on SDOF forced vibration
Specific Objective : Students able to calculate happened response caused by simple harmonic excitation and understand resonance phenomena on SDOF system

B. Desirable student competencies:
Student able to conceive and analyze periodic system of vibration on SDOF forced vibration

C. Course Method : 1. Presentation
2. Discussion/ Q & A
3. Home Work

D. Main course description : Forced vibration motion
E. Sub Course description : Undamped Forced Harmonic Vibration, Vibration Measuring Instrument, Harmonic Analysis

F. Course Activity:

No.	Progress	Time	Lecturer activity	Student activity	Course Appliances
1.	INTRODUCTION	10 minutes	1. explaining course material and references	Paying attention and asking	Computer, LCD Projector and White Board
2.	PRESENTATION	2 x 60 minutes	1. explaining the concept of forced vibration of SDOF mechanical vibration and to make its equation 2. explaining dynamic response of SDOF forced vibration calculation 3. Explaining Undamped forced harmonic vibration on a SDOF free vibration motion system 4. Explaining vibration measuring instrument and harmonic analysis on SDOF forced vibration system 5. Problem solving	Paying attention and asking	Computer, LCD Projector and White Board

			6. Problem exercise		
3.	CLOSING	20 minutes	1. Give Course Conclusion 2. Give Homework	Paying attention and asking	Computer, LCD Projector and White Board

G. Method of assessment : 1. Home Works
2. Mid Exam
3. Final Exam

H.Text Book :

Obliged :1.Steidel, Robert, F., Jr., *Introduction to Mechanical Vibrations* , 3 rd . Ed., John Willey & Sons, Ink, 1988.

2. James, M. L., Smith, G. M., Wolford, J. C., Whaley, P. P., *Vibration of Mechanical and Struktural Systems with Microcomputer Applications*, 2 nd. Ed., Harper Collins College Publishers, 1994.

Suggestion : 3.Timhoshenko, S., Young, D. H., and Weaver, W., Jr., *Vibration Problems in Engineering*, 4 th Ed., Wiley, 1974.

4. Den Hartog, J.P., *Mechanical Vibration*, Mc Graw - Hill, 1958.

5. Thomson, W. T., *Theory of Vibrations with Applications*, 3rd Ed., Prantice- Hall, 1988.

SAP

Subject : **Mechanical Vibration**
Subject Code : TKM 223
Subject Credit : 3
Class Schedule : 3x50 minutes
Lecture : 4th

A. Course Objective
General Objective : Students can understand transient vibration system on SDOF forced vibration system
Specific Objective : Students able to calculate response which happen caused by complicated harmonic excitation on SDOF system

B. Desirable student competencies:
Student can estimate initial condition and to analyze transient vibration on SDOF forced vibration system

C. Course Method : 1. Presentation
2. Discussion/ Q & A
3. Home Work

D. Main course description : Initial conditions and transient vibration
E. Sub Course description : The Rectangular Step Forcing Function, Ramp, Exponentially, Combination of Forcing Function connection

F. Course Activity:

No.	Progress	Time	Lecturer activity	Student activity	Course Appliances
1.	INTRODUCTION	10 minutes	1. explaining course material and references	Paying attention and asking	Computer, LCD Projector and White Board
2.	PRESENTATION	2 x 60 minutes	1. explaining transient motion vibration, modeling, and differential equation of SDOF force vibration 2. explaining how to determine initial condition 3. Explaining The Recta-ngular Step Forcing Func-tion dan Ramp Function 4. Explaining the use of Expo-nentially dan Combination of Forcing Function connection 5. Problem solving	Paying attention and asking	Computer, LCD Projector and White Board

			6. Problem exercise		
3.	CLOSING	20 minutes	1. Give Course Conclusion 2. Give Homework	Paying attention and asking	Computer, LCD Projector and White Board

G. Method of assessment : 1. Home Works
2. Mid Exam
3. Final Exam

H.Text Book :

Obliged :1.Steidel, Robert, F., Jr., *Introduction to Mechanical Vibrations* , 3 rd . Ed., John Willey & Sons, Ink, 1988.

2. James, M. L., Smith, G. M., Wolford, J. C., Whaley, P. P., *Vibration of Mechanical and Struktural Systems with Microcomputer Applications*, 2 nd. Ed., Harper Collins College Publishers, 1994.

Suggestion :

3.Timhoshenko, S., Young, D. H., and Weaver, W., Jr., *Vibration Problems in Engineering*, 4 th Ed., Wiley, 1974.

4. Den Hartog, J.P., *Mechanical Vibration*, Mc Graw - Hill, 1958.

5. Thomson, W. T., *Theory of Vibrations with Applications*, 3rd Ed., Prantice- Hall, 1988.

SAP

Subject : **Mechanical Vibration**
Subject Code : TKM 223
Subject Credit : 3
Class Schedule : 3x50 minutes
Lecture : 5th

A. Course Objective
General Objective : Students can understand various type of damping on SDOF vibration system
Specific Objective : Students can identify various type of damping and able to use it on SDOF free or force vibration system

B. Desirable student competencies:
Student can conceive sytem of motion which damped vibration on SDOF cases

C. Course Method : 1. Presentation
2. Discussion/ Q & A
3. Home Work

D. Main course description : Type of Damping
E. Sub Course description : Viscous Damping, Hysteretic Damping, Complex Damping, Coulomb Damping

F. Course Activity:

No.	Progress	Time	Lecturer activity	Student activity	Course Appliances
1.	INTRODUCTION	10 minutes	1. explaining course material and references	Paying attention and asking	Computer, LCD Projector and White Board
2.	PRESENTATION	2 x 60 minutes	1. explaining damped vibration motion on SDOF cases 2. explaining SDOF damped vibration system example 3. Explaining type of damping : Viscous Damping, Hys-teretic Damping, Complex Damping dan Coulomb Damping 4. Explaining the use of Expo-nentially dan Combination of Forcing Function connection 5. Problem solving 6. Problem exercise	Paying attention and asking	Computer, LCD Projector and White Board

3.	CLOSING	20 minutes	1. Give Course Conclusion 2. Give Homework	Paying attention and asking	Computer, LCD Projector and White Board

G. Method of assessment : 1. Home Works
2. Mid Exam
3. Final Exam

H.Text Book :

Obliged :1.Steidel, Robert, F., Jr., *Introduction to Mechanical Vibrations* , 3 rd . Ed., John Willey & Sons, Ink, 1988.

2. James, M. L., Smith, G. M., Wolford, J. C., Whaley, P. P., *Vibration of Mechanical and Struktural Systems with Microcomputer Applications*, 2 nd. Ed., Harper Collins College Publishers, 1994.

Suggestion :

3.Timhoshenko, S., Young, D. H., and Weaver, W., Jr., *Vibration Problems in Engineering*, 4 th Ed., Wiley, 1974.

4. Den Hartog, J.P., *Mechanical Vibration*, Mc Graw - Hill, 1958.

5. Thomson, W. T., *Theory of Vibrations with Applications*, 3rd Ed., Prantice- Hall, 1988.

SAP

Subject : **Mechanical Vibration**
Subject Code : TKM 223
Subject Credit : 3
Class Schedule : 3x50 minutes
Lecture : 6th

A. Course Objective
General Objective : Students can understand SDOF forced motion vibration
Specific Objective : Students can able to calculate response which happened caused by simple harmonic excitation on a system which contained various type of damping and understand resonance phenomena on SDOF free/forced vibration system

B. Desirable student competencies:
Student able to estimate dynamic response on SDOF damped vibration cases

C. Course Method : 1. Presentation
2. Discussion/ Q & A
3. Home Work

D. Main course description : Damped Forced Vibration
E. Sub Course description : Forced Damped Harmonic Vibration, Rotating Unbalanced, Vibration Isolation, Seismic Instrument, Forced Harmonic Vibration With Hysteresis Damping, With Dry Friction Damping, Eqeuivalent Viscous Damping

F. Course Activity:

No.	Progress	Time	Lecturer activity	Student activity	Course Appliances
1.	INTRODUCTION	10 minutes	1. explaining course material and references	Paying attention and asking	Computer, LCD Projector and White Board
2.	PRESENTATION	2 x 60 minutes	1. explaining sytem modeling of damped forced vibration and make SDOF differential equation 2. explaining SDOF damped forced vibration system example: Rotating Unbalanced, Vibration Iso-lation dan Seismic Instru-ment 3. Explaining vibration with Hysteresis Damping, vibra-tion with Dry Friction Damping dan	Paying attention and asking	Computer, LCD Projector and White Board

			Equivalent Viscous Damping 4. Problem solving 5. Problem exercise		
3.	CLOSING	20 minutes	1. Give Course Conclusion 2. Give Homework	Paying attention and asking	Computer, LCD Projector and White Board

G. Method of assessment : 1. Home Works
2. Mid Exam
3. Final Exam

H.Text Book :

Obliged :1.Steidel, Robert, F., Jr., *Introduction to Mechanical Vibrations* , 3 rd . Ed., John Willey & Sons, Ink, 1988.

2. James, M. L., Smith, G. M., Wolford, J. C., Whaley, P. P., *Vibration of Mechanical and Struktural Systems with Microcomputer Applications*, 2 nd. Ed., Harper Collins College Publishers, 1994.

Suggestion :

3.Timhoshenko, S., Young, D. H., and Weaver, W., Jr., *Vibration Problems in Engineering*, 4 th Ed., Wiley, 1974.

4. Den Hartog, J.P., *Mechanical Vibration*, Mc Graw - Hill, 1958.

5. Thomson, W. T., *Theory of Vibrations with Applications*, 3rd Ed., Prantice- Hall, 1988.

SAP

Subject : **Mechanical Vibration**
Subject Code : TKM 223
Subject Credit : 3
Class Schedule : 3x50 minutes
Lecture : 7th

A. Course Objective
General Objective : Students can understand SDOF non linear vibration system
Specific Objective : Students can understand basic non linear motion equation and able to solve simple cases on SDOF free/forced vibration system

B. Desirable student competencies:
Student able to estimate SDOF nonlinear vibration system cases

C. Course Method : 1. Presentation
2. Discussion/ Q & A
3. Home Work

D. Main course description : Non-Linear Vibration SDOF
E. Sub Course description : Linearity & Nonlinearity, Discontinuos Nonlinearity, Linearization by approximation, forced Vibration of Non Linear System

F. Course Activity:

No.	Progress	Time	Lecturer activity	Student activity	Course Appliances
1.	INTRODUCTION	10 minutes	1. explaining course material and references	Paying attention and asking	Computer, LCD Projector and White Board
2.	PRESENTATION	2 x 60 minutes	1. explaining the definition of linearity concept and non linearity on SDOF cases 2. discontinous linearity and its mathematic equation also Linearization by approx-imation 3. Explaining forced vibra-tion of non-linear system Problem solving 4. Problem exercise	Paying attention and asking	Computer, LCD Projector and White Board
3.	CLOSING	20 minutes	1. Give Course Conclusion 2. Give Homework	Paying attention and asking	Computer, LCD Projector and White Board

G. Method of assessment : 1. Home Works
2. Mid Exam
3. Final Exam

H.Text Book :

Obliged :1.Steidel, Robert, F., Jr., *Introduction to Mechanical Vibrations* , 3 rd . Ed., John Willey & Sons, Ink, 1988.

2. James, M. L., Smith, G. M., Wolford, J. C., Whaley, P. P., *Vibration of Mechanical and Struktural Systems with Microcomputer Applications*, 2 nd. Ed., Harper Collins College Publishers, 1994.

Suggestion :

3.Timhoshenko, S., Young, D. H., and Weaver, W., Jr., *Vibration Problems in Engineering*, 4 th Ed., Wiley, 1974.

4. Den Hartog, J.P., *Mechanical Vibration*, Mc Graw - Hill, 1958.

5. Thomson, W. T., *Theory of Vibrations with Applications*, 3rd Ed., Prantice- Hall, 1988.

SAP

Subject : **Mechanical Vibration**
Subject Code : TKM 223
Subject Credit : 3
Class Schedule : 3x50 minutes
Lecture : 8th

A. Course Objective
General Objective : To Measure student capability after attending course 1 to 7
Specific Objective : To Measure student capability after attending course 1 to 7

B. Desirable student competencies:
Student have read and remembered materials which have been given, listen carefully and can summarize it

C. Course Method : 1. Essay Problems
2. Closed Books
D. Main course description : 1st Exam
E. Sub course description : Course material 1 to 7
F. Course Activity:

Lecturer

1. Give problems
2. Assesing problems

Student

1. Doing 1st Exam
2. Repeating 1st exam as homework

G. Method of assessment: 1.Home work
2. 1st Exam

H.Text Book :
Obliged :1.Steidel, Robert, F., Jr., *Introduction to Mechanical Vibrations* , 3 rd . Ed., John Willey & Sons, Ink, 1988.
2. James, M. L., Smith, G. M., Wolford, J. C., Whaley, P. P., *Vibration of Mechanical and Struktural Systems with Microcomputer Applications*, 2 nd. Ed., Harper Collins College Publishers, 1994.

Suggestion :
3.Timhoshenko, S., Young, D. H., and Weaver, W., Jr., *Vibration Problems in Engineering*, 4 th Ed., Wiley, 1974.
4. Den Hartog, J.P., *Mechanical Vibration*, Mc Graw - Hill, 1958.
5. Thomson, W. T., *Theory of Vibrations with Applications*, 3rd Ed., Prantice- Hall, 1988.

SAP

Subject : **Mechanical Vibration**
Subject Code : TKM 223
Subject Credit : 3
Class Schedule : 3x50 minutes
Lecture : 9th

A. Course Objective
General Objective : Students can understand TDOF motion system and able to differentiate it with SDOF system
Specific Objective : Students can understand and recognize the differences between SDOF wath TDOF, able to make motion equation and to solve it and knowing the purpose of dynamic absorber

B. Desirable student competencies:
Student able to estimate TDOF vibrated sytem of motion

C. Course Method : 1. Presentation
2. Discussion/ Q & A
3. Home Work

D. Main course description : TDOF vibration system
E. Sub Course description : Free Vibration and Frequency Equation, Modes and Modal Fraction, Principle Coordinates for TOD, Coupled Modes and Coupled Coordinates, Rayleigh's Principle, Dynamic Vibration Absorbers, Transmission of Forces

F. Course Activity:

No.	Progress	Time	Lecturer activity	Student activity	Course Appliances
1.	INTRODUCTION	10 minutes	1. explaining course material and references	Paying attention and asking	Computer, LCD Projector and White Board
2.	PRESENTATION	2 x 60 minutes	1. explaining TDOF vibration system, the difference between TDOF and SDOF, modeling, and making differential equation 2. Explaining free vibration and frequency equation of TDOF 3. Explaining modes and modal Fraction, principle coordinates for TOD and coupled modes and coupled coordinates 4. Rayleigh's Principle,	Paying attention and asking	Computer, LCD Projector and White Board

			dynamic vibra-tion absorbers and Trans-mission of Forces 5. problem solving 6. Problem exercise		
3.	CLOSING	20 minutes	1. Give Course Conclusion 2. Give Homework	Paying attention and asking	Computer, LCD Projector and White Board

G. Method of assessment : 1. Home Works
2. Mid Exam
3. Final Exam

H.Text Book :

Obliged :1.Steidel, Robert, F., Jr., *Introduction to Mechanical Vibrations* , 3 rd . Ed., John Willey & Sons, Ink, 1988.

2. James, M. L., Smith, G. M., Wolford, J. C., Whaley, P. P., *Vibration of Mechanical and Struktural Systems with Microcomputer Applications*, 2 nd. Ed., Harper Collins College Publishers, 1994.

Suggestion : 3.Timhoshenko, S., Young, D. H., and Weaver, W., Jr., *Vibration Problems in Engineering*, 4 th Ed., Wiley, 1974.

4. Den Hartog, J.P., *Mechanical Vibration*, Mc Graw - Hill, 1958.

5. Thomson, W. T., *Theory of Vibrations with Applications*, 3rd Ed., Prantice- Hall, 1988.

SAP

Subject : **Mechanical Vibration**
Subject Code : TKM 223
Subject Credit : 3
Class Schedule : 3x50 minutes
Lecture : 9th

A. Course Objective
General Objective : Students can understand TDOF motion system and able to differentiate it with SDOF system
Specific Objective : Students can understand and recognize the differences between SDOF wath TDOF, able to make motion equation and to solve it and knowing the purpose of dynamic absorber

B. Desirable student competencies:
Student able to estimate TDOF vibrated sytem of motion

C. Course Method : 1. Presentation
2. Discussion/ Q & A
3. Home Work

D. Main course description : TDOF vibration system
E. Sub Course description : Free Vibration and Frequency Equation, Modes and Modal Fraction, Principle Coordinates for TOD, Coupled Modes and Coupled Coordinates, Rayleigh's Principle, Dynamic Vibration Absorbers, Transmission of Forces

F. Course Activity:

No.	Progress	Time	Lecturer activity	Student activity	Course Appliances
1.	INTRODUCTION	10 minutes	1. explaining course material and references	Paying attention and asking	Computer, LCD Projector and White Board
2.	PRESENTATION	2 x 60 minutes	1. explaining TDOF vibration system, the difference between TDOF and SDOF, modeling, and making differential equation 2. Explaining free vibration and frequency equation of TDOF 3. Explaining modes and modal Fraction, principle coordinates for TOD and coupled modes and coupled coordinates 4. Rayleigh's Principle,	Paying attention and asking	Computer, LCD Projector and White Board

			dynamic vibra-tion absorbers and Trans-mission of Forces 5. problem solving 6. Problem exercise		
3.	CLOSING	20 minutes	1. Give Course Conclusion 2. Give Homework	Paying attention and asking	Computer, LCD Projector and White Board

G. Method of assessment : 1. Home Works
2. Mid Exam
3. Final Exam

H.Text Book :

Obliged :1.Steidel, Robert, F., Jr., *Introduction to Mechanical Vibrations* , 3 rd . Ed., John Willey & Sons, Ink, 1988.

2. James, M. L., Smith, G. M., Wolford, J. C., Whaley, P. P., *Vibration of Mechanical and Struktural Systems with Microcomputer Applications*, 2 nd. Ed., Harper Collins College Publishers, 1994.

Suggestion : 3.Timhoshenko, S., Young, D. H., and Weaver, W., Jr., *Vibration Problems in Engineering*, 4 th Ed., Wiley, 1974.

4. Den Hartog, J.P., *Mechanical Vibration*, Mc Graw - Hill, 1958.

5. Thomson, W. T., *Theory of Vibrations with Applications*, 3rd Ed., Prantice- Hall, 1988.

SAP

Subject : **Mechanical Vibration**
Subject Code : TKM 223
Subject Credit : 3
Class Schedule : 3x50 minutes
Lecture : 10th

A. Course Objective
General Objective : Students can understand TDOF motion system in torsional vibration
Specific Objective : Students able to make differential equation of motion and to solve it on TDOF torsional vibration

B. Desirable student competencies:
Student able to estimate TDOF torsional vibrated system of motion

C. Course Method : 1. Presentation
2. Discussion/ Q & A
3. Home Work

D. Main course description : Torsional Vibration TDOF

E. Sub Course description : Discrete Systems, Torsional Vibration, Holzer's Method, Kinematically Equivalent system, Forced Vibration of Torsional System

F. Course Activity:

No.	Progress	Time	Lecturer activity	Student activity	Course Appliances
1.	INTRODUCTION	10 minutes	1. explaining course material and references	Paying attention and asking	Computer, LCD Projector and White Board
2.	PRESENTATION	2 x 60 minutes	1. explaining discrete system and torsional vibration system on TDOF cases, modeling, and making differential equation 2. Explaining Holzer's Method dan Kinematically Equivalent system on torsional vibration system 3. Explaining Forced Vibration of Torsional System 4. problem solving	Paying attention and asking	Computer, LCD Projector and White Board

			5. Problem exercise		
3.	CLOSING	20 minutes	1. Give Course Conclusion 2. Give Homework	Paying attention and asking	Computer, LCD Projector and White Board

G. Method of assessment : 1. Home Works
2. Mid Exam
3. Final Exam

H.Text Book :
Obliged :1.Steidel, Robert, F., Jr., *Introduction to Mechanical Vibrations* , 3 rd . Ed., John Willey & Sons, Ink, 1988.
2. James, M. L., Smith, G. M., Wolford, J. C., Whaley, P. P., *Vibration of Mechanical and Struktural Systems with Microcomputer Applications*, 2 nd. Ed., Harper Collins College Publishers, 1994.

Suggestion :
3.Timhoshenko, S., Young, D. H., and Weaver, W., Jr., *Vibration Problems in Engineering*, 4 th Ed., Wiley, 1974.
4. Den Hartog, J.P., *Mechanical Vibration*, Mc Graw - Hill, 1958.
5. Thomson, W. T., *Theory of Vibrations with Applications*, 3rd Ed., Prantice- Hall, 1988.

SAP

Subject : **Mechanical Vibration**
Subject Code : TKM 223
Subject Credit : 3
Class Schedule : 3x50 minutes
Lecture : 11th

A. Course Objective
General Objective : Students can identify discrete system and solving method
Specific Objective : Students can know and understand discrete modeling procedure also able to operate it in computer

B. Desirable student competencies:
Student able to estimate discrete system of motion using matrix and FEM method

C. Course Method : 1. Presentation
2. Discussion/ Q & A
3. Home Work

D. Main course description : Discrete system

E. Sub Course description : Analysis using Matrix and FEM method

F. Course Activity:

No.	Progress	Time	Lecturer activity	Student activity	Course Appliances
1.	INTRODUCTION	10 minutes	1. explaining course material and references	Paying attention and asking	Computer, LCD Projector and White Board
2.	PRESENTATION	2 x 60 minutes	1. explaining discrete system, modeling, and making solving method 2. Explaining descrete system analysis using matrix method 3. Explaining descrete system analysis using FEM method 4. problem solving 5. Problem exercise	Paying attention and asking	Computer, LCD Projector and White Board
3.	CLOSING	20 minutes	1. Give Course Conclusion 2. Give Homework	Paying attention and asking	Computer, LCD Projector and White Board

G. Method of assessment : 1. Home Works
2. Mid Exam
3. Final Exam

H.Text Book :

Obliged :1.Steidel, Robert, F., Jr., *Introduction to Mechanical Vibrations* , 3 rd . Ed., John Willey & Sons, Ink, 1988.

2. James, M. L., Smith, G. M., Wolford, J. C., Whaley, P. P., *Vibration of Mechanical and Struktural Systems with Microcomputer Applications*, 2 nd. Ed., Harper Collins College Publishers, 1994.

Suggestion : 3.Timhoshenko, S., Young, D. H., and Weaver, W., Jr., *Vibration Problems in Engineering*, 4 th Ed., Wiley, 1974.

4. Den Hartog, J.P., *Mechanical Vibration*, Mc Graw - Hill, 1958.

5. Thomson, W. T., *Theory of Vibrations with Applications*, 3rd Ed., Prantice- Hall, 1988.

SAP

Subject : **Mechanical Vibration**
Subject Code : TKM 223
Subject Credit : 3
Class Schedule : 3x50 minutes
Lecture : 12th

A. Course Objective
General Objective : To Measure student capability after attending course 9 to 11
Specific Objective : To Measure student capability after attending course 9 to 11

B. Desirable student competencies:
Student have read and remembered materials which have been given, listen carefully and can summarize it

C. Course Method : 1. Essay Problems
2. Closed Books
D. Main course description : 2nd Exam
E. Sub course description : Course material 9 to 11
F. Course Activity:

Lecturer

1. Give problems
2. Assesing problems

Student

1. Doing 2nd Exam
2. Repeating 2nd exam as homework

G. Method of assessment: 1.Home work
2. 2nd Exam

H.Text Book :
Obliged :1.Steidel, Robert, F., Jr., *Introduction to Mechanical Vibrations* , 3 rd . Ed., John Willey & Sons, Ink, 1988.
2. James, M. L., Smith, G. M., Wolford, J. C., Whaley, P. P., *Vibration of Mechanical and Struktural Systems with Microcomputer Applications*, 2 nd. Ed., Harper Collins College Publishers, 1994.
Suggestion : 3.Timhoshenko, S., Young, D. H., and Weaver, W., Jr., *Vibration Problems in Engineering*, 4 th Ed., Wiley, 1974.
4. Den Hartog, J.P., *Mechanical Vibration*, Mc Graw - Hill, 1958.
5. Thomson, W. T., *Theory of Vibrations with Applications*, 3rd Ed., Prantice- Hall, 1988.

SAP

Subject : **Mechanical Vibration**
Subject Code : TKM 223
Subject Credit : 3
Class Schedule : 3x50 minutes
Lecture : 13th

A. Course Objective
General Objective : Students can identify discrete continous vibration using distributed modeling and able to solve it
Specific Objective : Students know the difference between discrete and continous approach, making and to solve it

B. Desirable student competencies:
Student able to conceive continous sytem of motion, to transform it into distributed system

C. Course Method : 1. Presentation
2. Discussion/ Q & A
3. Home Work

D. Main course description : Distributed Systems

E. Sub Course description : Wave Equation, Transverse Vibration of Uniform Beams, Rotation and Shear Effects, The Effect of Axial Loading

F. Course Activity:

No.	Progress	Time	Lecturer activity	Student activity	Course Appliances
1.	INTRODUCTION	10 minutes	1. explaining course material and references	Paying attention and asking	Computer, LCD Projector and White Board
2.	PRESENTATION	2 x 60 minutes	1. explaining continous vibration system and its application 2. Explaining continous vibration system through distributed system also making wave equation 3. Explaining several continous vibration system cases : Transverse Vibra-tion of Uniform Beams and Rotation and Shear Effects 4. Explaining The Effect of Axial Loading on	Paying attention and asking	Computer, LCD Projector and White Board

			continous vibration system 5. problem solving 6. Problem exercise		
3.	CLOSING	20 minutes	1. Give Course Conclusion 2. Give Homework	Paying attention and asking	Computer, LCD Projector and White Board

G. Method of assessment : 1. Home Works
2. Mid Exam
3. Final Exam

H.Text Book :

Obliged :1.Steidel, Robert, F., Jr., *Introduction to Mechanical Vibrations* , 3 rd . Ed., John Willey & Sons, Ink, 1988.

2. James, M. L., Smith, G. M., Wolford, J. C., Whaley, P. P., *Vibration of Mechanical and Struktural Systems with Microcomputer Applications*, 2 nd. Ed., Harper Collins College Publishers, 1994.

Suggestion : 3.Timhoshenko, S., Young, D. H., and Weaver, W., Jr., *Vibration Problems in Engineering*, 4 th Ed., Wiley, 1974.

4. Den Hartog, J.P., *Mechanical Vibration*, Mc Graw - Hill, 1958.

5. Thomson, W. T., *Theory of Vibrations with Applications*, 3rd Ed., Prantice- Hall, 1988.

SAP

Subject : **Mechanical Vibration**
Subject Code : TKM 223
Subject Credit : 3
Class Schedule : 3x50 minutes
Lecture : 14th

A. Course Objective
General Objective : Students can identify random vibration system and its application
Specific Objective : Students can identify and understand random vibration aspect also to solve it

B. Desirable student competencies:
Student able to simulate random vibration sytem of motion and to applicate it in real life

C. Course Method : 1. Presentation
2. Discussion/ Q & A
3. Home Work

D. Main course description : Random Vibration System

E. Sub Course description : Random Vibration in SDOF, Response to Random Exitation

F. Course Activity:

No.	Progress	Time	Lecturer activity	Student activity	Course Appliances
1.	INTRODUCTION	10 minutes	1. explaining course material and references	Paying attention and asking	Computer, LCD Projector and White Board
2.	PRESENTATION	2 x 60 minutes	1. explaining random vibration system and its application 2. Explaining how to make SDOF random vibration system 3. Explaining dynamic sytem response using random excitation 4. problem solving 5. Problem exercise	Paying attention and asking	Computer, LCD Projector and White Board
3.	CLOSING	20 minutes	1. Give Course Conclusion 2. Give Homework	Paying attention and asking	Computer, LCD Projector and White

					Board

G. Method of assessment : 1. Home Works
2. Mid Exam
3. Final Exam

H.Text Book :

Obliged :1.Steidel, Robert, F., Jr., *Introduction to Mechanical Vibrations* , 3 rd . Ed., John Willey & Sons, Ink, 1988.

2. James, M. L., Smith, G. M., Wolford, J. C., Whaley, P. P., *Vibration of Mechanical and Struktural Systems with Microcomputer Applications*, 2 nd. Ed., Harper Collins College Publishers, 1994.

Suggestion :

3.Timhoshenko, S., Young, D. H., and Weaver, W., Jr., *Vibration Problems in Engineering*, 4 th Ed., Wiley, 1974.

4. Den Hartog, J.P., *Mechanical Vibration*, Mc Graw - Hill, 1958.

5. Thomson, W. T., *Theory of Vibrations with Applications*, 3rd Ed., Prantice- Hall, 1988.

SAP

Subject : **Mechanical Vibration**
Subject Code : TKM 223
Subject Credit : 3
Class Schedule : 2x60 minutes
Lecture : 16th

A. Course Objective
General Objective: To Measure student capability after attending all mechanical vibration Classes
Specific Objective : To Measure student capability after attending all mechanical vibration classes

B. Soft Skill Component: Student have read and remembered materials which have been given, listen carefully and can summarize it

C. Course Method : 1. Essay Problems
2. Closed Books
D. Fundamental Discussion : Final Exam
E. Sub Fundamental Discussion : All corse material
F. Course Activity:

Lecturer

1. Give problems
2. Assesing problems

Student

1. Doing final Exam

G.Method of Assessment : 1. Home Work
2. 1st and 2nd exam
3. Final Exam

H.Text Book :
Obliged :1.Steidel, Robert, F., Jr., *Introduction to Mechanical Vibrations* , 3 rd . Ed., John Willey & Sons, Ink, 1988.
2. James, M. L., Smith, G. M., Wolford, J. C., Whaley, P. P., *Vibration of Mechanical and Struktural Systems with Microcomputer Applications*, 2 nd. Ed., Harper Collins College Publishers, 1994.

Suggestion : 3.Timhoshenko, S., Young, D. H., and Weaver, W., Jr., *Vibration Problems in Engineering*, 4 th Ed., Wiley, 1974.
4. Den Hartog, J.P., *Mechanical Vibration*, Mc Graw - Hill, 1958.
5. Thomson, W. T., *Theory of Vibrations with Applications*, 3rd Ed., Prantice- Hall, 1988.

GARIS-GARIS BESAR PROGRAM PEMBELAJARAN

Subjects Title : Heat Exchanger
Subjects Code : TKM / 2 SKS 226
Brief Description :
1. This subjects is a chosen subjects.
2. This subjects is Energy Conversion Field specialist.
3. Instrument : Whiteboard, LCD.
4. Students attendance minimum are 75%.
5. Learning process consist: class interaction, individual or group assignment, mid semester dan final test.

General Course Objectives : Students is expected able to choose the suitable heat exchanger for use on certain thermal unit to design thermal equipment

No	COURSE OBJECTIVES	MAIN COURSE DESCRIPTION	SUB COURSE DESCRIPTION	TIME ESTIMATE	COURSE METHOD	DESIRABLE STUDENT COMPETENCY	TEXTBOOK
1	To get basic understanding about heat exchanger	Heat exchanger introduction	▪ Explanation, working principle, heat exchanger type and function	90	Lecture and discussion	Interest on material	Text Book1,2
2	Able to understand first heat exchanger thermal analysis aspect	First heat exchanger thermal analysis	▪ LMTD method use	90	Lecture, discussionand homework	Discipline on class and assignment	Text Book1,2
3	Able to understand second heat exchanger thermal analysis aspect	Second heat exchanger thermal analysis	▪ NTU method use	90	Lecture, discussionand homework	Discipline on class and assignment	Text Book1,2
4	Able to calculate heat exchanger pressure drop	Pressure drop on first heat exchanger Penurunan tekanan pada penukar kalor 1	▪ Heat exchanger pressure drop equation ▪ Persamaan penurunan tekanan pada penukar kalor	90	Lecture, discussionand homework Kuliah, diskusi dan tugas (PR)	Discipline on class and assignment	Text Book1,2
5	Able to calculate heat exchanger pressure drop in various geometry	Pressure drop on second heat exchanger	▪ Relation between pressure drop and heat exchanger geometry surface	90	Lecture, discussionand homework	Discipline on class and assignment	Text Book1,2
6	Able to recognize transient response (temperature) take place on heat exchanger	Transient response (temperature) on heat exchanger	▪ Transient response (temperature) on heat exchanger direct heat exchange type and periodic heat exchange type	90	Lecture, discussionand homework	Discipline on class and assignment	Text Book1,2
7		TEST		90	Open books test	Resolute Honesty	
8	Able to calculate pressure drop on heat exchanger inlet or outlet	Pressure loss coefficient Koefisien rugi tekanan	▪ Pressure loss coefficient on narrow and expand channel	90	Lecture, discussionand homework	Discipline on class and assignment	Text Book1,2

9	Able to finish heat transfer and pressure loss on frist hear exchanger	First graphical solution Solusi grafis pada penukar kalor 1	▪ Nusselt number and Reynolds number relation on a tube	90	Lecture, discussionand homework	Discipline on class and assignment	Text Book1,2
10	Able to finish heat transfer and pressure loss on second hear exchanger	Second graphical solution Solusi grafis pada penukar kalor 2	▪ Relation between Reynolds number and Nusselt number on matrix heat exchanger	90	Lecture, discussionand homework	Discipline on class and assignment	Text Book1,2
11	Able to analyze condenser and evaporator difference	Condenser and Evaporator	▪ Basic thermal analysis on condenser and evaporator	90	Lecture, discussionand homework	Discipline on class and assignment	Text Book1,3
12	Able to calculate condenser basic design	Condenser	▪ Condenser design steps	90	Lecture, discussionand homework	Discipline on class and assignment	Text Book1,3
13	Able to calculate evaporator basic design	Evaporator	▪ Evaporator design steps	90	Lecture, discussionand homework	Discipline on class and assignment	Text Book1,3
14		Final Exam		90		Independentcy and Honesty	

Text Book:

1. F.P. Incropera & David P. Dewit : Fundamentals of Heat & Mass Transfer
2. Kay & London : Compact heat exchanger
3. D.Q.Kern: Process heat transfer

SATUAN ACARA PEMBELAJARAN (SAP)

SUBJECTS TITLE	:	Heat Exchanger
SUBJECTS CODE	:	TKM 2
SEMESTER CREDIT UNITS	:	2 SCU
CLASS/LABORATORY SCHEDULE	:	90 minute, 1 time a week
LECTURE	:	1

A. COURSE OBJECTIVES
1. GENERAL OBJECTIVES : Students able to understand working principle and heat exchanger type.
2 SPECIFIC OBJECTIVE : Students able to explain working principle, heat exchanger type and useful.
B. DESIRABLE STUDENT COMPETENCY : Able to think systematic and draw interest on teaches subject.
C. COURSE METHOD : Lecture, Question and Answer.
D. MAIN COURSE DESCRIPTION : Heat exchanger introduction.
E. SUB COURSE DESCRIPTION : Working principle, heat exchanger type and advantage.
F. COURSE ACTIVITY

NO	STAGES	TIME ESTI MATE	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General explanation	Following lecture	LCD-PowerPoint
2	PRESENTATION	70	Heat exchanger material explanation, working principle, type and advantage	Following lecture	LCD-PowerPoint
3	CLOSING	10	Question-answer, conclusion, etc.	Question and Answer	Whiteboard

G. METHODS OF ASSESSMENT : Evaluation from question-answer conclusion, as basic use for giving assignment on next lecture.
H. TEXTBOOK :

Textbook:

1. F.P. Incropera & David P. Dewit : Fundamentals of Heat & Mass Transfer
2. Kay & London: Compact heat exchanger
3. D.Q.Kern ; Process heat transfer

SATUAN ACARA PEMBELAJARAN (SAP)

SUBJECTS TITLE	:	Heat Exchanger
SUBJECTS CODE	:	TKM 2
SEMESTER CREDIT UNITS	:	2 SCU
CLASS/LABORATORY SCHEDULE	:	90 minute, 1 time a week
LECTURE	:	2

A. COURSE OBJECTIVES

1. GENERAL OBJECTIVES : Students able to understand heat exchanger thermal analysis method
2. SPECIFIC OBJECTIVE : Students able to calculate thermal analysis using LMTD method

B. DESIRABLE STUDENT COMPETENCY : Able to think systematic, serious and discipline

C. COURSE METHOD : Lecturing, question-answer

D. MAIN COURSE DESCRIPTION : Heat exchanger thermal analysis

E. SUB MAIN COURSE DESCRIPTION : LMTD method thermal analysis

F. COURSE ACTIVITY

NO	STAGES	TIME ESTIMATE	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General explanation	Following lecture	LCD-PowerPoint
2	PRESENTATION	70	Explain heat exchanger thermal analysis LMTD method	Following lecture	LCD-PowerPoint
3	CLOSING	10	Question-answer, conclusion, etc.	Question and Answer	Whiteboard

G. METHODS OF ASSESSMENT : Evaluation from question-answer conclusion, as basic use for giving assignment on next lecture.

H. TEXTBOOK :

Textbook:

1. F.P. Incropera & David P. Dewit : Fundamentals of Heat & Mass Transfer
2. Kay & London,: Compact heat exchanger
3. D.Q.Kern ; Process heat transfer Kern

SATUAN ACARA PEMBELAJARAN (SAP)

SUBJECTS TITLE	:	Heat Exchanger
SUBJECTS CODE	:	TKM 2
SEMESTER CREDIT UNITS	:	2 SCU
CLASS/LABORATORY SCHEDULE	:	90 minute, 1 time a week
LECTURE	:	3

A. COURSE OBJECTIVES
1. GENERAL OBJECTIVES : Students able to understand second heat exchanger thermal analysis method
2 SPECIFIC OBJECTIVE : Students able to calculate thermal analysis using NTU method
B. DESIRABLE STUDENT COMPETENCY : Able to think systematic, serious and discipline
C. COURSE METHOD : Lecturing, question and answer

D. MAIN COURSE DESCRIPTION : Second heat exchanger thermal analysis
E. SUB MAIN COURSE DESCRIPTION : Thermal analysis NTU method
F. COURSE ACTIVITY

NO	STAGES	TIME ESTI MATE	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General explanation	Following lecture	LCD-PowerPoint
2	PRESENTATIO N	70	Explain heat exchanger thermal analysis NTU method	Following lecture	LCD-PowerPoint
3	CLOSING	10	Question-answer, conclusion, etc.	Question and Answer	Whiteboard

G. METHODS OF ASSESSMENT : Evaluation from question-answer conclusion, as basic use for giving assignment on next lecture..
H. TEXTBOOK :

Textbook:

1. F.P. Incropera & David P. Dewit : Fundamentals of Heat & Mass Transfer
2. Kay & London,: Compact heat exchanger
3. D.Q.Kern ; Process heat transfer Kern

SATUAN ACARA PEMBELAJARAN (SAP)

SUBJECTS TITLE	:	Heat Exchanger
SUBJECTS CODE	:	TKM 2
SEMESTER CREDIT UNITS	:	2 SCU
CLASS/LABORATORY SCHEDULE	:	90 minute, 1 time a week
LECTURE	:	4

A. COURSE OBJECTIVES

1. GENERAL OBJECTIVES : Students able to understand about heat exchanger pressure drop.

2 SPECIFIC OBJECTIVE : Students able to calculate pressure drop on heat exchanger

B. DESIRABLE STUDENT COMPETENCY : Able to think systematic and draw interest on teaches subject.

C. COURSE METHOD : Lecture, Question and Answer.

D. MAIN COURSE DESCRIPTION : Pressure drop on first heat exchanger

E. SUB MAIN COURSE DESCRIPTION : Pressure drop equation

F. COURSE ACTIVITY

NO	STAGES	TIME ESTIMATE	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General explanation	Following lecture	LCD-PowerPoint
2	PRESENTATION	70	Explain pressure drop equation	Following lecture	LCD-PowerPoint
3	CLOSING	10	Question-answer, conclusion, etc.	Question and Answer	Whiteboard

G. METHODS OF ASSESSMENT : Evaluation from question-answer conclusion, as basic use for giving assignment on next lecture.

H. TEXTBOOK :

Textbook:

1. F.P. Incropera & David P. Dewit : Fundamentals of Heat & Mass Transfer
2. Kay & London,: Compact heat exchanger
3. D.Q.Kern ; Process heat transfer Kern

SATUAN ACARA PEMBELAJARAN (SAP)

SUBJECTS TITLE	:	Heat Exchanger
SUBJECTS CODE	:	TKM 2
SEMESTER CREDIT UNITS	:	2 SCU
CLASS/LABORATORY SCHEDULE	:	90 minute, 1 time a week
LECTURE	:	5

A. COURSE OBJECTIVES

1. GENERAL OBJECTIVES : Students able to understand pressure drop take place on heat exchanger geometry differences.

2 SPECIFIC OBJECTIVE : Students able to calculate pressure drop on different heat exchanger

B. DESIRABLE STUDENT COMPETENCY : Able to think systematic and draw interest on teaches subject.

C. COURSE METHOD : Lecture, Question and Answer.

D. MAIN COURSE DESCRIPTION : Pressure drop on second heat exchanger

E. SUB MAIN COURSE DESCRIPTION : Geometry relation and pressure drop

F. COURSE ACTIVITY

NO	STAGES	TIME ESTIMATE	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General explanation	Following lecture	LCD-PowerPoint
2	PRESENTATION	70	Explain geometry relation and pressure drop	Following lecture	LCD-PowerPoint
3	CLOSING	10	Question-answer, conclusion, etc.	Question and Answer	Whiteboard

G. METHODS OF ASSESSMENT : Evaluation from question-answer conclusion, as basic use for giving assignment on next lecture.

H. TEXTBOOK :

Textbook:

1. F.P. Incropera & David P. Dewit : Fundamentals of Heat & Mass Transfer
2. Kay & London,: Compact heat exchanger
3. D.Q.Kern ; Process heat transfer

SATUAN ACARA PEMBELAJARAN (SAP)

SUBJECTS TITLE	:	Heat Exchanger
SUBJECTS CODE	:	TKM 2
SEMESTER CREDIT UNITS	:	2 SCU
CLASS/LABORATORY SCHEDULE	:	90 minute, 1 time a week
LECTURE	:	6

A. COURSE OBJECTIVES

1. GENERAL OBJECTIVES : Students able to understand transient response take place on heat exchanger

2 SPECIFIC OBJECTIVE : Students able to calculate transient response value on heat exchanger

B. DESIRABLE STUDENT COMPETENCY : Able to think systematic and draw interest on teaches subject.

C. COURSE METHOD : Lecture, Question and Answer.

D. MAIN COURSE DESCRIPTION : Transient response

E. SUB MAIN COURSE DESCRIPTION : Transient response on PK direct heat exchange type and periodic heat exchange type

F. COURSE ACTIVITY

NO	STAGES	TIME ESTIMATE	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General explanation	Following lecture	LCD-PowerPoint
2	PRESENTATION	70	Explain transient response influence on different PK	Following lecture	LCD-PowerPoint
3	CLOSING	10	Question-answer, conclusion, etc.	Question and Answer	Whiteboard

G. METHODS OF ASSESSMENT : Evaluation from question-answer conclusion, as basic use for giving assignment on next lecture.

H. TEXTBOOK :

Textbook:

1. F.P. Incropera & David P. Dewit : Fundamentals of Heat & Mass Transfer
2. Kay & London,: Compact heat exchanger
3. D.Q.Kern ; Process heat transfer Kern

SATUAN ACARA PEMBELAJARAN (SAP)

SUBJECTS TITLE	:	Heat Exchanger
SUBJECTS CODE	:	TKM 2
SEMESTER CREDIT UNITS	:	2 SCU
CLASS/LABORATORY SCHEDULE	:	90 minute, 1 time a week
LECTURE	:	7

A. COURSE OBJECTIVES

1. GENERAL OBJECTIVES : Students able to understand pressure loss on narrow and expand channel

2 SPECIFIC OBJECTIVE : Students able to calculate pressure loss coefficient on narrow and expand channel.

B. DESIRABLE STUDENT COMPETENCY : Able to think systematic and draw interest on teaches subject.

C. COURSE METHOD : Lecture, Question and Answer.

D. MAIN COURSE DESCRIPTION : Pressure loss coefficient

E. SUB MAIN COURSE DESCRIPTION : Pressure loss coefficient on narrow and expand channel

F. COURSE ACTIVITY

NO	STAGES	TIME ESTIMATE	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General explanation	Following lecture	LCD-PowerPoint
2	PRESENTATION	70	Explain pressure loss coefficient influence on PK	Following lecture	LCD-PowerPoint
3	CLOSING	10	Question-answer, conclusion, etc.	Question and Answer	Whiteboard

G. METHODS OF ASSESSMENT : Evaluation from question-answer conclusion, as basic use for giving assignment on next lecture.

H. TEXTBOOK :

Textbook:

1. F.P. Incropera & David P. Dewit : Fundamentals of Heat & Mass Transfer
2. Kay & London,: Compact heat exchanger
3. D.Q.Kern ; Process heat transfer Kern

SATUAN ACARA PEMBELAJARAN (SAP)

SUBJECTS TITLE	:	Heat Exchanger
SUBJECTS CODE	:	TKM 2
SEMESTER CREDIT UNITS	:	2 SCU
CLASS/LABORATORY SCHEDULE	:	90 minute, 1 time a week
LECTURE	:	8

A. COURSE OBJECTIVES

1. GENERAL OBJECTIVES : Students able to understand heat exchange calculation steps graphically

2 SPECIFIC OBJECTIVE : Students able to calculate Nusselt number as Reynolds number function

B. DESIRABLE STUDENT COMPETENCY : Able to think systematic and draw interest on teaches subject.

C. COURSE METHOD : Lecture, Question and Answer.

D. MAIN COURSE DESCRIPTION : First graphical solution

E. SUB MAIN COURSE DESCRIPTION : Nusselt number and Reynolds number relation on a tube

F. COURSE ACTIVITY

NO	STAGES	TIME ESTI MATE	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General explanation	Following lecture	LCD-PowerPoint
2	PRESENTATIO N	70	Calculate Nusselt number graphically on a tube	Following lecture	LCD-PowerPoint
3	CLOSING	10	Question-answer, conclusion, etc.	Question and Answer	Whiteboard

G. METHODS OF ASSESSMENT : Evaluation from question-answer conclusion, as basic use for giving assignment on next lecture.

H. TEXTBOOK :

Textbook:

1. F.P. Incropera & David P. Dewit : Fundamentals of Heat & Mass Transfer
2. Kay & London,: Compact heat exchanger
3. D.Q.Kern ; Process heat transfer Kern

SATUAN ACARA PEMBELAJARAN (SAP)

SUBJECTS TITLE	:	Heat Exchanger
SUBJECTS CODE	:	TKM 2
SEMESTER CREDIT UNITS	:	2 SCU
CLASS/LABORATORY SCHEDULE	:	90 minute, 1 time a week
LECTURE	:	9

A. COURSE OBJECTIVES

GENERAL OBJECTIVES : Students able to understand heat exchange calculation steps graphically

2 SPECIFIC OBJECTIVE : Students able to calculate Nusselt number as Reynolds number function on matrix heat exchanger

B. DESIRABLE STUDENT COMPETENCY : Able to think systematic and draw interest on teaches subject.

C. COURSE METHOD : Lecture, Question and Answer.

D. MAIN COURSE DESCRIPTION : Second graphical solution

E. SUB MAIN COURSE DESCRIPTION : Students able to calculate Nusselt number as Reynolds number function on matrix heat exchanger

F. COURSE ACTIVITY

NO	STAGES	TIME ESTIMATE	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General explanation	Following lecture	LCD-PowerPoint
2	PRESENTATION	70	Explain calculation Nusselt number on matrix PK	Following lecture	LCD-PowerPoint
3	CLOSING	10	Question-answer, conclusion, etc.	Question and Answer	Whiteboard

G. METHODS OF ASSESSMENT : Evaluation from question-answer conclusion, as basic use for giving assignment on next lecture.

H. TEXTBOOK :

Textbook:

1. F.P. Incropera & David P. Dewit : Fundamentals of Heat & Mass Transfer
2. Kay & London,: Compact heat exchanger
3. D.Q.Kern ; Process heat transfer Kern

SATUAN ACARA PEMBELAJARAN (SAP)

SUBJECTS TITLE	:	Heat Exchanger
SUBJECTS CODE	:	TKM 2
SEMESTER CREDIT UNITS	:	2 SCU
CLASS/LABORATORY SCHEDULE	:	90 minute, 1 time a week
LECTURE	:	10

A. COURSE OBJECTIVES

1. GENERAL OBJECTIVES type : Students able to understand function and condenser and evaporator

2 SPECIFIC OBJECTIVE : Students able to thermal analysis on condenser and evaporator

B. DESIRABLE STUDENT COMPETENCY : Able to think systematic and draw interest on teaches subject.

C. COURSE METHOD : Lecture, Question and Answer.

D. MAIN COURSE DESCRIPTION : Condenser and evaporator

E. SUB MAIN COURSE DESCRIPTION : Thermal analysis on condenser and evaporator

F. COURSE ACTIVITY

NO	TAHAPAN	WAKTU	KEGIATAN PENGAJAR	KEGIATAN MAHASISWA	MEDIA DAN ALAT PEMBELAJARAN
1	INTRODUCTION	10	General explanation	Following lecture	LCD-PowerPoint
2	PRESENTATION	70	Explain thermal analysis on condenser and evaporator	Following lecture	LCD-PowerPoint
3	CLOSING	10	Question-answer, conclusion, etc.	Question and Answer	Whiteboard

G. METHODS OF ASSESSMENT : Evaluation from question-answer conclusion, as basic use for giving assignment on next lecture.

H. TEXTBOOK :

Textbook:

1. F.P. Incropera & David P. Dewit : Fundamentals of Heat & Mass Transfer
2. Kay & London,: Compact heat exchanger
3. D.Q.Kern ; Process heat transfer Kern

SATUAN ACARA PEMBELAJARAN (SAP)

SUBJECTS TITLE	:	Heat Exchanger
SUBJECTS CODE	:	TKM 2
SEMESTER CREDIT UNITS	:	2 SCU
CLASS/LABORATORY SCHEDULE	:	90 minute, 1 time a week
LECTURE	:	11

A. COURSE OBJECTIVES

1. GENERAL OBJECTIVES : Students able to understand condenser design steps

2 SPECIFIC OBJECTIVE : Students able to calculate or design a condenser

B. DESIRABLE STUDENT COMPETENCY : Able to think systematic and draw interest on teaches subject.

C. COURSE METHOD : Lecture, Question and Answer.

D. MAIN COURSE DESCRIPTION : Condenser

E. SUB MAIN COURSE DESCRIPTION : Condenser design steps

F. COURSE ACTIVITY

NO	STAGES	TIME ESTIMATE	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General explanation	Following lecture	LCD-PowerPoint
2	PRESENTATION	70	Explain condenser design steps	Following lecture	LCD-PowerPoint
3	CLOSING	10	Question-answer, conclusion, etc.	Question and Answer	Whiteboard

G. METHODS OF ASSESSMENT : Evaluation from question-answer conclusion, as basic use for giving assignment on next lecture.

H. TEXTBOOK :

Textbook:

1. F.P. Incropera & David P. Dewit : Fundamentals of Heat & Mass Transfer
2. Kay & London,: Compact heat exchanger
3. D.Q.Kern ; Process heat transfer Kern

SATUAN ACARA PEMBELAJARAN (SAP)

SUBJECTS TITLE	:	Heat Exchanger
SUBJECTS CODE	:	TKM 2
SEMESTER CREDIT UNITS	:	2 SCU
CLASS/LABORATORY SCHEDULE	:	90 minute, 1 time a week
LECTURE	:	12

A. COURSE OBJECTIVES

1. GENERAL OBJECTIVES : Students able to understand evaporator design steps

2 SPECIFIC OBJECTIVE : Students able to calculate or design a evaporator

B. DESIRABLE STUDENT COMPETENCY : Able to think systematic and draw interest on teaches subject.

C. COURSE METHOD : Lecture, Question and Answer.

D. MAIN COURSE DESCRIPTION : Evaporator

E. SUB MAIN COURSE DESCRIPTION : Evaporator design steps

F. COURSE ACTIVITY

NO	STAGES	TIME ESTIMATE	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General explanation	Following lecture	LCD-PowerPoint
2	PRESENTATION	70	Explain evaporator design steps	Following lecture	LCD-PowerPoint
3	CLOSING	10	Question-answer, conclusion, etc.	Question and Answer	Whiteboard

G. METHODS OF ASSESSMENT : Evaluation from question-answer conclusion, as basic use for giving assignment on next lecture.

H. TEXTBOOK :

Textbook:

1. F.P. Incropera & David P. Dewit : Fundamentals of Heat & Mass Transfer
2. Kay & London,: Compact heat exchanger
3. D.Q.Kern ; Process heat transfer Kern

GARIS-GARIS BESAR PROGRAM PEMBELAJARAN

SUBJECTS TITLE : Termodinamika I
SUBJECTS CODE : TKM 233 / 2 SKS / III
BRIEF DESCRIPTION :
GENERAL COURSE OBJECTIVES : After following this class students is expected

1. Understand First and Second Law of Themodynamics
2. Understand thermodynamics properties evaluation process a substance and can use thermodynamics properties data that kept in table form and graphic to analyze a system
3. Able to make a system books order base on mass control analysis and control volume analysis.

No	COURSE OBJECTIVES	MAIN COURSE DESCRIPTION	SUB COURSE DESCRIPTION	TIME ESTIMATE	COURSE METHOD	DESIRABLE STUDENT COMPETENCY	TEXTBOOK
1	▪ Able to describe a system on thermodynamics case and understand the system interaction with surroundings ▪ Understand International System and British unit that use for thermodynamics case ▪ Understand thermal balance and pressure thermodynamically to determine pressure and temperature measuring level ▪ Understand design and analysis thermodynamics system	System explanation and unit system		90	Presentation and discussion	Able to present opinion	Michael J.Moran; Howard N.Shapiro, Fundamentals of Engineering Thermodynamics
2	▪ Understand energy concept base on mechanical science ▪ Able to evaluate energy transfer as work ▪ Understand energy inside a system	First Law of Thermodynamics		90	Presentation and discussion	Able to present opinion Mampu mengutarakan pendapat	Michael J.Moran; Howard N.Shapiro, Fundamentals of Engineering Thermodynamics
3	▪ Able to evaluate energy transfer as heat ▪ Able to make a energy system books order as mass control ▪ Able to analyze a cycle	First Law of Thermodynamics		90	Presentation and discussion	Able to present opinion Mampu mengutarakan pendapat	Michael J.Moran; Howard N.Shapiro, Fundamentals of Engineering

							Thermodynamics
4	▪ Understand thermodynamics properties and able to use table and graphic thermodynamics properties to find it properties at known condition	Thermodynamics properties evaluation		90	Presentation and discussion	Able to present opinion Mampu mengutarakan pendapat	Michael J.Moran; Howard N.Shapiro, Fundamentals of Engineering Thermodynamics
5	▪ Able to determine thermodynamics ideal gas properties	Thermodynamics properties evaluation		90	Presentation and discussion	Able to present opinion Mampu mengutarakan pendapat	Michael J.Moran; Howard N.Shapiro, Fundamentals of Engineering Thermodynamics
6	▪ Know and understand mass conservation on control mass analysis	Control mass analysis		90	Presentation and discussion	Able to present opinion Mampu mengutarakan pendapat	Michael J.Moran; Howard N.Shapiro, Fundamentals of Engineering Thermodynamics
7	• Know and understand energy conservation on control mass analysis	Control mass analysis		90	Presentation and discussion	Able to present opinion Mampu mengutarakan pendapat	Michael J.Moran; Howard N.Shapiro, Fundamentals of Engineering Thermodynamics
8	• Know and understand mass conservation on control volume	Control volume analysis		90	Presentation and discussion	Able to present opinion Mampu mengutarakan pendapat	Michael J.Moran; Howard N.Shapiro, Fundamentals of Engineering Thermodynamics
9	• Know and understand energy conservation on control volume analysis	Control volume analysis		90	Presentation and discussion	Able to present opinion Mampu mengutarakan pendapat	Michael J.Moran; Howard N.Shapiro, Fundamentals of Engineering Thermodynamics
10	**Mid Semester**						Michael J.Moran; Howard N.Shapiro, Fundamentals of

							Engineering Thermodynamics
11	Know and understand second law thermodynamics concept and reverse process	Second Law of Thermodynamics		90	Presentation and discussion	Able to present opinion Mampu mengutarakan pendapat	Michael J.Moran; Howard N.Shapiro, Fundamentals of Engineering Thermodynamics
12	Can aplly second law to a thermodynamics cycle and able to determine maximum performance an operating cycle between two reservoir	Second Law of Thermodynamics		90	Presentation and discussion	Able to present opinion Mampu mengutarakan pendapat	Michael J.Moran; Howard N.Shapiro, Fundamentals of Engineering Thermodynamics
13	Able to determine entropy balance for control mass and control volume	Entropy Application		90	Presentation and discussion	Able to present opinion Mampu mengutarakan pendapat	Michael J.Moran; Howard N.Shapiro, Fundamentals of Engineering Thermodynamics
14	Understand isentropic process and able to determine isentropic efficiency for compressor, turbine, pump and nozzle	Entropy Application		90	Presentation and discussion	Able to present opinion Mampu mengutarakan pendapat	Michael J.Moran; Howard N.Shapiro, Fundamentals of Engineering Thermodynamics
15	FINAL EXAM						

Textbook :

Wajib : 1. Michael J.Moran; Howard N.Shapiro, Fundamentals of Engineering Thermodynamics

Anjuran : 1. Reynold, William C. Perkin; Henry, C., 1989 : *Termodinamika Teknik*, Edisi Terjemahan oleh Filino Harahap, Penerbit Erlangga, Jakarta.

2. Wagner, Cecil F., 1961 : *Thermodynamic Fundamentals for Engineers*, Littlefield Adam & Co. New Jersey.
3. Obert & Young, 1961, *Thermodynamics*, Mc.Graw-Hill Book Co., New York.
4. Sears & Zemansky, 1965 : *Thermodynamics Fundamental*, Mc.Graw-Hill Kogakusha, Tokyo

SATUAN ACARA PEMBELAJARAN (SAP)

SUBJECTS TITLE : Thermodynamics I
SUBJECTS CODE : TKM 233 / 2 SKS / III
SEMESTER CREDIT UNITS : 2
CLASS/LABORATORY SCHEDULE : 90 menit per pertemuan
LECTURE : 1 sampai 14

A. COURSE OBJECTIVES
1. GENERAL OBJECTIVES : see GBPP second column

2. SPECIFIC OBJECTIVE : see GBPP first column

B. DESIRABLE STUDENT COMPETENCY : Able to present opinion
C. COURSE METHOD : Presentation and discussion

D. MAIN COURSE DESCRIPTION : see GBPP second column
E. SUB COURSE DESCRIPTION :
F. COURSE ACTIVITY

NO	STAGES	TIME ESTIMATE	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	Repeat last lecture	Answer quiz or answer the question from lecturer	LCD
2	PRESENTATION	70	Lecturer give syllabus	Listen and discussion	LCD
3	CLOSING	10	Lecturer resume syllabus		LCD

G. METHODS OF ASSESSMENT :
H. TEXTBOOK :

GARIS-GARIS BESAR PROGRAM PEMBELAJARAN

Subjects Title : **Heat Transfer I**
Subjects Code : **TKM 242 / 2 SCU**
Brief Description :
1. This subjects is a chosen subjects.
2. This subjects is Energy Conversion Field specialist.
3. Instrument : Whiteboard, LCD.
4. Students attendance minimum are 75%.
5. Learning process consist: class interaction, individual or group assignment, mid semester dan final test.

General Course Objectives : Students is expected able to understand the conduction and radiation heat transfer concept also able to apply it to design thermal equipment

No	COURSE OBJECTIVES	MAIN COURSE DESCRIPTION	SUB COURSE DESCRIPTION	TIME ESTIMATE	COURSE METHOD	DESIRABLE STUDENT COMPETENCY	TEXTBOOK
1	Understand Heat transfer concept and heat transfer methods	Heat transfer introduction	▪ Explanation, methods, heat transfer, steady or unsteady and application	90	Class and Discussion	Interest on material	Text Book1,2,3
2	Understand conduction heat transfer general equation one dimensional on various geometry	Steady one dimensional heat transfer conduction	▪ General conduction equation in area ▪ One dimensional conduction steady without heat generate on plane surface, cylinder and sphere and wide changing plane	90	Lecture, discussionand homework	Discipline on class and assignment	Text Book1,2,3
3	Able to calculate steady conduction heat transfer and one dimensional	Steady One dimensional heat transfer conduction	▪ Conduction on composite field ▪ Total heat transfer coefficient ▪ Isolation critical thickness	90	Lecture, discussionand homework	Discipline on class and assignment	Text Book1,2
4	Able to calculate steady conduction heat transfer one dimensional using heat enhancement	Condution heat transfer using steady heat regeneration	▪ General conduction equation in heat regeneration area : plane surface, cylinder, and sphere	90	Lecture, discussionand homework	Discipline on class and assignment	Text Book1,2
5	Able to calculate fins heat transfer efficiency case	Fins heat transfer	▪ Fins heat transfer theoretical analysis ▪ Graphical solution	90	Lecture, discussionand homework	Discipline on class and assignment	Text Book1,2
6	Able to finish two dimensional conduction	Steady multi dimesional conduction heat transfer	▪ Two dimensional conduction solution using: analytical method, graphic method, shape factor method	90	Lecture, discussionand homework Kuliah, diskusi dan tugas (PR)	Discipline on class and assignment	Text Book1,2
7	Material review that already tought		▪ All Material 1 s/d 6	90	Homework Solution	Develop Independecy	Text Book1,2
8		Midtest		90	Open books Test	Resolute Honesty	

					Ujian buku terbuka		
9	Able to finish unsteady heat transfer on small plane	Unsteady one dimensional heat transfer	▪ Solution : joint capacity method, graphical method	90	Lecture, discussionand homework	Discipline on class and assignment	Text Book1,2,3
10	Able to finish unsteady heat transfer on three dimensional using graphic methods	Three dimensional graphical solution	▪ Solution : advanced graphical method – plane approach, semi and unfinite ▪ Multi dimensional solution	90	Lecture, discussionand homework	Discipline on class and assignment	Text Book1,3
11	Understand numerical solution concept	Steady state heat transfer numerical solution	▪ Finite method solution ▪ Steady state	90	Lecture, discussionand homework	Discipline on class and assignment	Text Book1,3
12	Understand numerical solution concept (continue)	Unsteady condition heat transfer numerical solution	▪ Unsteady condition unfinite method solution	90	Lecture, discussionand homework	Discipline on class and assignment	Text Book1,3
13	Understand basic radiation heat transfer	Radiation heat transfer and shape factor Perpindahan Panas Radiasi dan Faktor bentuk	▪ Wavelength spectrum and radiation ▪ Shape factor and black object heat transfer ▪ Spektrum panjang gelombang dan daya pancar	90	Lecture, discussionand homework	Discipline on class and assignment	Text Book1,2,3
14	Able tio calculate two plane radiation heat transfer	Radiation heat transfer on grey object between two object	▪ Surface and space shape factor ▪ Thermal nerwork factor on grey object between two object	90	Lecture, discussionand homework	Discipline on class and assignment	Text Book1,2,3
15	Able to calculate multi plane radiation heat transfer	Radiation heat transfer on grey object on multi object	Thermal network system on grey object for multi object and radiation heat transfer rate on each plane	90	Lecture, discussionand homework	Discipline on class and assignment	Text Book1,2,3
16		Final Exam		90		Independency and Honesty Kemandirian dan kejujuran	

Text Book:

1. F.P. Incropera & David P. Dewit : Fundamentals of Heat & Mass Transfer
2. JP. Holman : The Fundamental of Heat Transfer
3. F. KreithTheFundamental&HeatTransfer

SATUAN ACARA PEMBELAJARAN (SAP)

SUBJECTS TITLE	:	Heat Transfer I
SUBJECTS CODE	:	TKM 2
SEMESTER CREDIT UNITS	:	2 SCU
CLASS/LABORATORY SCHEDULE	:	90 minute, 1 time a week
LECTURE	:	1

A. COURSE OBJECTIVES
1. GENERAL OBJECTIVES : Students able to understand heat transfer concept and heat transfer methods
2 SPECIFIC OBJECTIVE : Students able to understand, differentiate, and determine heat transfer type
B. KEMAMPUAN SOFT SKILL : Able to think systematic and draw interest on teaches subject.
C. COURSE METHOD : Lecture, Question and Answer.
D. MAIN COURSE DESCRIPTION : Heat transfer introduction
E. SUB COURSE DESCRIPTION : Explanation and heat transfer methods
F. COURSE ACTIVITY

NO	STAGES	TIME ESTIMATE	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General explanation	Following lecture	LCD-PowerPoint
2	PRESENTATION	70	Explain method and mechanism each heat transfer	Following lecture	LCD-PowerPoint
3	CLOSING	10	Question-answer, conclusion, etc.	Question and Answer	Whiteboard

G. METHODS OF ASSESSMENT : Evaluation from question-answer conclusion, as basic use for giving assignment on next lecture.
H. TEXTBOOK :

Textbook:

1. F.P. Incropera & David P. Dewit : Fundamentals of Heat & Mass Transfer
2. JP. Holman : The Fundamental of Heat Transfer
3. F. KreithTheFundamental&HeatTransfer

SATUAN ACARA PEMBELAJARAN (SAP)

SUBJECTS TITLE	:	Heat Transfer I
SUBJECTS CODE	:	TKM 2
SEMESTER CREDIT UNITS	:	2 SCU
CLASS/LABORATORY SCHEDULE	:	90 minute, 1 time a week
LECTURE	:	2

A. COURSE OBJECTIVES
   1. GENERAL OBJECTIVES : Students able to un derstand one dimensional heat transfer conduction case
   2 SPECIFIC OBJECTIVE : Students able to describe one dimensional conduction case

B. KEMAMPUAN SOFT SKILL : Able to think systematic and draw interest on teaches subject.

C. COURSE METHOD : Lecture, Question and Answer.

D. MAIN COURSE DESCRIPTION : One dimensional heat transfer conduction

E. SUB COURSE DESCRIPTION :
   - General conduction equation in area
   - One dimensional conduction steady without heat generate on plane surface, cylinder and sphere

F. COURSE ACTIVITY

NO	STAGES	TIME ESTI MATE	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General explanation about one dimensional conduction heat transfer	Following lecture	LCD-PowerPoint
2	PRESENTATIO N	70	Explain conduction equation derivation on plane surface, cylinder, and sphere	Following lecture	LCD-PowerPoint
3	CLOSING	10	Question-answer, conclusion, etc.	Question and Answer	Whiteboard

G. METHODS OF ASSESSMENT : Evaluation from question-answer conclusion, as basic use for giving assignment on next lecture.

H. TEXTBOOK :

Textbook:

1. F.P. Incropera & David P. Dewit : Fundamentals of Heat & Mass Transfer
2. JP. Holman : The Fundamental of Heat Transfer
3. F. KreithTheFundamental&HeatTransfer

SATUAN ACARA PEMBELAJARAN (SAP)

SUBJECTS TITLE	:	Heat Transfer I
SUBJECTS CODE	:	TKM 2
SEMESTER CREDIT UNITS	:	2 SCU
CLASS/LABORATORY SCHEDULE	:	90 minute, 1 time a week
LECTURE	:	3

A. COURSE OBJECTIVES
   1. GENERAL OBJECTIVES : Students able to understand heat transfer conduction case on composite field
   2 SPECIFIC OBJECTIVE : Students able to finished conduction case on composite field

B. KEMAMPUAN SOFT SKILL : Able to think systematic and draw interest on teaches subject.
C. COURSE METHOD : Lecture, Question and Answer.
D. MAIN COURSE DESCRIPTION : One dimensional heat transfer conduction on composite field
E. SUB COURSE DESCRIPTION :
   - General conduction equation on composite field, plate and cylinder
   - Total heat transfer coefficient

F. COURSE ACTIVITY

NO	STAGES	TIME ESTI MATE	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	Explanation about heat transfer conduction on composite field	Following lecture	LCD-PowerPoint
2	PRESENTATIO N	70	Explain heat transfer conduction calculation on composite field	Following lecture	LCD-PowerPoint
3	CLOSING	10	Question-answer, conclusion, etc.	Question and Answer	Whiteboard

G. METHODS OF ASSESSMENT : Evaluation from question-answer conclusion, as basic use for giving assignment on next lecture.
H. TEXTBOOK :

Textbook:

1. F.P. Incropera & David P. Dewit : Fundamentals of Heat & Mass Transfer
2. JP. Holman : The Fundamental of Heat Transfer
3. F. KreithTheFundamental&HeatTransfer

SATUAN ACARA PEMBELAJARAN (SAP)

SUBJECTS TITLE	:	Heat Transfer I
SUBJECTS CODE	:	TKM 2
SEMESTER CREDIT UNITS	:	2 SCU
CLASS/LABORATORY SCHEDULE	:	90 minute, 1 time a week
LECTURE	:	4

A. COURSE OBJECTIVES

1. GENERAL OBJECTIVES : Students able to understand heat transfer conduction case using heat enhancement and steady
2. SPECIFIC OBJECTIVE : Students able to finished one dimensional conduction case using heat enhancement

B. KEMAMPUAN SOFT SKILL : Able to think systematic and draw interest on teaches subject.

C. COURSE METHOD : Lecture, Question and Answer.

D. MAIN COURSE DESCRIPTION : One dimensional heat transfer conduction

E. SUB COURSE DESCRIPTION :
- General conduction equation in area
- One dimensional conduction steady without heat enhancement, oh plane surface, cylinder and sphere

F. COURSE ACTIVITY

NO	STAGES	TIME ESTIMATE	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	Explanation about heat transfer conduction using heat generate	Following lecture	LCD-PowerPoint
2	PRESENTATION	70	Explain conduction equation using heat generate on plane surface, cylinder and sphere	Following lecture	LCD-PowerPoint
3	CLOSING	10	Question-answer, conclusion, etc.	Question and Answer	Whiteboard

G. METHODS OF ASSESSMENT : Evaluation from question-answer conclusion, as basic use for giving assignment on next lecture.

H. TEXTBOOK :

Textbook:

1. F.P. Incropera & David P. Dewit : Fundamentals of Heat & Mass Transfer
2. JP. Holman : The Fundamental of Heat Transfer
3. F. KreithTheFundamental&HeatTransfer

SATUAN ACARA PEMBELAJARAN (SAP)

SUBJECTS TITLE	:	Heat Transfer I
SUBJECTS CODE	:	TKM 2
SEMESTER CREDIT UNITS	:	2 SCU
CLASS/LABORATORY SCHEDULE	:	90 minute, 1 time a week
LECTURE	:	5

A. COURSE OBJECTIVES

1. GENERAL OBJECTIVES : Students able to understand the benefit of using fins

2 SPECIFIC OBJECTIVE : Students able to finished fins efficiency case and transfer rate escalation

B. KEMAMPUAN SOFT SKILL : Able to think systematic and draw interest on teaches subject.

C. COURSE METHOD : Lecture, Question and Answer.

D. MAIN COURSE DESCRIPTION : Heat transfer conduction on fins surface

E. SUB COURSE DESCRIPTION :
- General temperature distribution equation on fins
- Fins efficiency and general fins surface equation

F. COURSE ACTIVITY

NO	STAGES	TIME ESTIMATE	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	Explanation about fins use benefit	Following lecture	LCD-PowerPoint
2	PRESENTATION	70	Explain temperature distribution equation and fins efficiency	Following lecture	LCD-PowerPoint
3	CLOSING	10	Question-answer, conclusion, etc.	Question and Answer	Whiteboard

G. METHODS OF ASSESSMENT : Evaluation from question-answer conclusion, as basic use for giving assignment on next lecture.

H. TEXTBOOK :

Textbook:

1. F.P. Incropera & David P. Dewit : Fundamentals of Heat & Mass Transfer
2. JP. Holman : The Fundamental of Heat Transfer
3. F. KreithTheFundamental&HeatTransfer

SATUAN ACARA PEMBELAJARAN (SAP)

SUBJECTS TITLE	:	Heat Transfer I
SUBJECTS CODE	:	TKM 2
SEMESTER CREDIT UNITS	:	2 SCU
CLASS/LABORATORY SCHEDULE	:	90 minute, 1 time a week
LECTURE	:	6

A. COURSE OBJECTIVES

1. GENERAL OBJECTIVES : Students able to differentiate heat transfer conduction multi dimensional case

2 SPECIFIC OBJECTIVE : Students able to finished multi dimensional (2 and 3) conduction

B. KEMAMPUAN SOFT SKILL : Able to think systematic and draw interest on teaches subject.

C. COURSE METHOD : Lecture, Question and Answer.

D. MAIN COURSE DESCRIPTION : Multi dimensional heat transfer conduction

E. SUB COURSE DESCRIPTION : Exact science method solution and shape factor

F. COURSE ACTIVITY

NO	STAGES	TIME ESTIMATE	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General explanation one, two, and three dimensional conduction difference	Following lecture	LCD-PowerPoint
2	PRESENTATION	70	Explain multi dimensional conduction solution according to exact science and shape factor	Following lecture	LCD-PowerPoint
3	CLOSING	10	Question-answer, conclusion, etc.	Question and Answer	Whiteboard

G. METHODS OF ASSESSMENT : Evaluation from question-answer conclusion, as basic use for giving assignment on next lecture.

H. TEXTBOOK :

Textbook:

1. F.P. Incropera & David P. Dewit : Fundamentals of Heat & Mass Transfer
2. JP. Holman : The Fundamental of Heat Transfer
3. F. KreithTheFundamental&HeatTransfer

SATUAN ACARA PEMBELAJARAN (SAP)

SUBJECTS TITLE	:	Heat Transfer I
SUBJECTS CODE	:	TKM 2
SEMESTER CREDIT UNITS	:	2 SCU
CLASS/LABORATORY SCHEDULE	:	90 minute, 1 time a week
LECTURE	:	7

A. COURSE OBJECTIVES
   1. GENERAL OBJECTIVES : Students able to understand unsteady heat transfer conduction case
   2 SPECIFIC OBJECTIVE : Students able to finished unsteady one dimensional conduction using joint capacity method

B. KEMAMPUAN SOFT SKILL : Able to think systematic and draw interest on teaches subject.

C. COURSE METHOD : Lecture, Question and Answer.

D. MAIN COURSE DESCRIPTION : Unsteady heat transfer conduction

E. SUB COURSE DESCRIPTION :
   - Heat transfer solution on small object using joint capacity method

F. COURSE ACTIVITY

NO	STAGES	TIME ESTIMATE	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General explanation unsteady heat transfer conduction	Following lecture	LCD-PowerPoint
2	PRESENTATION	70	Explain solution using joint capacity method	Following lecture	LCD-PowerPoint
3	CLOSING	10	Question-answer, conclusion, etc.	Question and Answer	Whiteboard

G. METHODS OF ASSESSMENT : Evaluation from question-answer conclusion, as basic use for giving assignment on next lecture.

H. TEXTBOOK :

Textbook:

1. F.P. Incropera & David P. Dewit : Fundamentals of Heat & Mass Transfer
2. JP. Holman : The Fundamental of Heat Transfer
3. F. KreithTheFundamental&HeatTransfer

SATUAN ACARA PEMBELAJARAN (SAP)

SUBJECTS TITLE	:	Heat Transfer I
SUBJECTS CODE	:	TKM 2
SEMESTER CREDIT UNITS	:	2 SCU
CLASS/LABORATORY SCHEDULE	:	90 minute, 1 time a week
LECTURE	:	8

A. COURSE OBJECTIVES

1. GENERAL OBJECTIVES : Students able to understand graphical solution on unsteady three dimensional axis heat transfer conduction
2. SPECIFIC OBJECTIVE : Students able to finished unsteady conduction case on three dimensional axis with graphical method

B. KEMAMPUAN SOFT SKILL : Able to think systematic and draw interest on teaches subject.

C. COURSE METHOD : Lecture, Question and Answer.

D. MAIN COURSE DESCRIPTION : Unsteady three dimensional heat transfer conduction

E. SUB COURSE DESCRIPTION : Unsteady conduction solution on plate, cylinder and sphere using graphical method

F. COURSE ACTIVITY

NO	STAGES	TIME ESTI MATE	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General explanation about unsteady three dimensional heat transfer conduction	Following lecture	LCD-PowerPoint
2	PRESENTATIO N	70	Explain solution using graphical method	Following lecture	LCD-PowerPoint
3	CLOSING	10	Question-answer, conclusion, etc.	Question and Answer	Whiteboard

G. METHODS OF ASSESSMENT : Evaluation from question-answer conclusion, as basic use for giving assignment on next lecture.

H. TEXTBOOK :

Textbook:

1. F.P. Incropera & David P. Dewit : Fundamentals of Heat & Mass Transfer
2. JP. Holman : The Fundamental of Heat Transfer
3. F. KreithTheFundamental&HeatTransfer

SATUAN ACARA PEMBELAJARAN (SAP)

SUBJECTS TITLE	:	Heat Transfer I
SUBJECTS CODE	:	TKM 2
SEMESTER CREDIT UNITS	:	2 SCU
CLASS/LABORATORY SCHEDULE	:	90 minute, 1 time a week
LECTURE	:	9

A. COURSE OBJECTIVES
   1. GENERAL OBJECTIVES : Students able to understand nemurical solution on heat transfer case
   2 SPECIFIC OBJECTIVE : Students able to arrange steady conduction solution steps

B. KEMAMPUAN SOFT SKILL : Able to think systematic and draw interest on teaches subject.
C. COURSE METHOD : Lecture, Question and Answer.
D. MAIN COURSE DESCRIPTION : Numerical solution steady heat transfer conduction
E. SUB COURSE DESCRIPTION : Back and forth finite equation and central and matrix arrangement
F. COURSE ACTIVITY

NO	STAGES	TIME ESTIMATE	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General explanation about numerical solution	Following lecture	LCD-PowerPoint
2	PRESENTATION	70	Explain matrix arrangement equation for steady condition	Following lecture	LCD-PowerPoint
3	CLOSING	10	Question-answer, conclusion, etc.	Question and Answer	Whiteboard

G. METHODS OF ASSESSMENT : Evaluation from question-answer conclusion, as basic use for giving assignment on next lecture.
H. TEXTBOOK :

Textbook:

1. F.P. Incropera & David P. Dewit : Fundamentals of Heat & Mass Transfer
2. JP. Holman : The Fundamental of Heat Transfer
3. F. KreithTheFundamental&HeatTransfer

SATUAN ACARA PEMBELAJARAN (SAP)

SUBJECTS TITLE	:	Heat Transfer I
SUBJECTS CODE	:	TKM 2
SEMESTER CREDIT UNITS	:	2 SCU
CLASS/LABORATORY SCHEDULE	:	90 minute, 1 time a week
LECTURE	:	10

A. COURSE OBJECTIVES

1. GENERAL OBJECTIVES : Students able to understand numerical solution unsteady heat transfer conduction

2 SPECIFIC OBJECTIVE : Students able to finished unsteady conduction case numerically

B. KEMAMPUAN SOFT SKILL : Able to think systematic and draw interest on teaches subject.

C. COURSE METHOD : Lecture, Question and Answer.

D. MAIN COURSE DESCRIPTION : Numerical solution unsteady heat transfer conduction

E. SUB COURSE DESCRIPTION : Matrix arrangement, explicit and implicit method

F. COURSE ACTIVITY

NO	STAGES	TIME ESTI MATE	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	General explanation about unsteady numerical solution	Following lecture	LCD-PowerPoint
2	PRESENTATIO N	70	Explain arrangement matrix equation for unsteady conduction	Following lecture	LCD-PowerPoint
3	CLOSING	10	Question-answer, conclusion, etc.	Question and Answer	Whiteboard

G. METHODS OF ASSESSMENT : Evaluation from question-answer conclusion, as basic use for giving assignment on next lecture.

H. TEXTBOOK :

Textbook:

1. F.P. Incropera & David P. Dewit : Fundamentals of Heat & Mass Transfer
2. JP. Holman : The Fundamental of Heat Transfer
3. F. KreithTheFundamental&HeatTransfer

SATUAN ACARA PEMBELAJARAN (SAP)

SUBJECTS TITLE	:	Heat Transfer I
SUBJECTS CODE	:	TKM 2
SEMESTER CREDIT UNITS	:	2 SCU
CLASS/LABORATORY SCHEDULE	:	90 minute, 1 time a week
LECTURE	:	11

A. COURSE OBJECTIVES

1. GENERAL OBJECTIVES : Students able to understand radiation heat transfer case

2 SPECIFIC OBJECTIVE : Students able to finished radiation heat transfer case

B. KEMAMPUAN SOFT SKILL : Able to think systematic and draw interest on teaches subject.

C. COURSE METHOD : Lecture, Question and Answer.

D. MAIN COURSE DESCRIPTION : Radiation heat transfer

E. SUB COURSE DESCRIPTION : Thermal radiation spectrum
- Steady one dimensional conduction without heat enhancement on plane surface, cylinder and sphere

F. COURSE ACTIVITY

NO	STAGES	TIME ESTIMATE	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	Explanation concept and radiation heat transfer application	Following lecture	LCD-PowerPoint
2	PRESENTATION	70	Explain radiation spectrum, radiant energy and shape factor	Following lecture	LCD-PowerPoint
3	CLOSING	10	Question-answer, conclusion, etc.	Question and Answer	Whiteboard

G. METHODS OF ASSESSMENT : Evaluation from question-answer conclusion, as basic use for giving assignment on next lecture.

H. TEXTBOOK :

Textbook:

1. F.P. Incropera & David P. Dewit : Fundamentals of Heat & Mass Transfer
2. JP. Holman : The Fundamental of Heat Transfer
3. F. KreithTheFundamental&HeatTransfer

SATUAN ACARA PEMBELAJARAN (SAP)

SUBJECTS TITLE	:	Heat Transfer I
SUBJECTS CODE	:	TKM 2
SEMESTER CREDIT UNITS	:	2 SCU
CLASS/LABORATORY SCHEDULE	:	90 minute, 1 time a week
LECTURE	:	12

A. COURSE OBJECTIVES

1. GENERAL OBJECTIVES : Students able to differentiate radiation heat transfer on black object, grey and real thing

2 SPECIFIC OBJECTIVE : Students able to finished radiation heat transfer case on grey object

B. KEMAMPUAN SOFT SKILL : Able to think systematic and draw interest on teaches subject.

C. COURSE METHOD : Lecture, Question and Answer.

D. MAIN COURSE DESCRIPTION : Radiation heat transfer on two grey plane thing

E. SUB COURSE DESCRIPTION : Emissive, absorbsivity and transmisivity
Radiation heat transfer on two grey plane

F. COURSE ACTIVITY

NO	STAGES	TIME ESTIMATE	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	Explanation concept about grey object radiation heat transfer	Following lecture	LCD-PowerPoint
2	PRESENTATION	70	Explain grey object radiation heat transfer solution Menerangkan penyelesain perpindahan panas radiasi benda abu-abu	Following lecture	LCD-PowerPoint
3	CLOSING	10	Question-answer, conclusion, etc.	Question and Answer	Whiteboard

G. METHODS OF ASSESSMENT : Evaluation from question-answer conclusion, as basic use for giving assignment on next lecture.

H. TEXTBOOK :

Textbook:

1. F.P. Incropera & David P. Dewit : Fundamentals of Heat & Mass Transfer
2. JP. Holman : The Fundamental of Heat Transfer
3. F. KreithTheFundamental&HeatTransfer

SATUAN ACARA PEMBELAJARAN (SAP)

SUBJECTS TITLE	:	Heat Transfer I
SUBJECTS CODE	:	TKM 2
SEMESTER CREDIT UNITS	:	2 SCU
CLASS/LABORATORY SCHEDULE	:	90 minute, 1 time a week
LECTURE	:	13

A. COURSE OBJECTIVES

1. GENERAL OBJECTIVES : Students able to understand grey object radiation on multi plane

2 SPECIFIC OBJECTIVE : Students able to finished grey radiation heat transfer case on multi plane

B. KEMAMPUAN SOFT SKILL : Able to think systematic and draw interest on teaches subject.

C. COURSE METHOD : Lecture, Question and Answer.

D. MAIN COURSE DESCRIPTION : Grey object radiation heat transfer on multi plane

E. SUB COURSE DESCRIPTION : Thermal network system on multi plane radiation heat transfer

F. COURSE ACTIVITY

NO	STAGES	TIME ESTIMATE	LECTURER	STUDENT ACTIVITY	RESOURCES COMMONLY AVAILABLE
1	INTRODUCTION	10	Explanation about radiation influence on multi plane	Following lecture	LCD-PowerPoint
2	PRESENTATION	70	Explain grey object radiation heat transfer case on multi plane	Following lecture	LCD-PowerPoint
3	CLOSING	10	Question-answer, conclusion, etc.	Question and Answer	Whiteboard

G. METHODS OF ASSESSMENT : Evaluation from question-answer conclusion, as basic use for giving assignment on next lecture.

H. TEXTBOOK :

Textbook:

1. F.P. Incropera & David P. Dewit : Fundamentals of Heat & Mass Transfer
2. JP. Holman : The Fundamental of Heat Transfer
3. F. KreithTheFundamental&HeatTransfer

SYLLABUS

Subject Title : Structure & Properties of Material
Subject Code / Credits / SMT : TKM 247 / 2 / IV

Week	Course Topics	Lecturer Activity / Course Equipment	Criterion of Assessment	Reference	Presence
1.	- Introduction - Atomic scale structure	Theoretical lecture/ OHP and white board	• Structure of atom and bond of atom • Material properties	Cch 1-2. ref. 1 Ccha 2 –3, ref. 1	
2.	Dot defect and difussion, linear defect, plane, voleme	Theoretical lecture/ OHP and white board	Student are able to explain of : 1. Material defect 2. Mechanism of material diffusion 3. Grain boundary diffusion	Ch. 4-5 ref. 1	
3.	Cristal material and non cristal material	Theoretical lecture/ OHP and white board	Student are able to explain of : 1. Glass Transition Temperature 2. Viscous Deformation 3. Structure and property of polimer amorpus and semi cristalin 4. Structure and property of glass 5. Structure and polimer property and elastomer	Ch 6 ref. 1	
4.	Stability phase and phase diagram	Theoretical lecture/ OHP and white board	Student are able to explain of : 1. Phase of quilibrium and diagram of 2 phase 2. TTT and CCT diagram	Ch.9.3 ref. 5 Ch. 9 ref. 3	
5.	Kinetic and Transformasion of micro structure	Theoretical lecture/ OHP and white board	Student are able to explain of : 1. Cooling time and structure of micro 2. Structure of steel micro material	Ch.9.3 ref. 5 Ch. 9 ref. 3	
6.	Material heat treatment	Theoretical lecture/ OHP and white board	Student are able to explain of : 1. Konsep pelunakan and pengerasan material 2. Waktu pendinginan and media pendingin 3. Proses anil, celup cepat, tempering, normalising	Ch.9.3 ref. 5 Ch. 9 ref. 3	
7.	Mid Exam	Test di kelas	Hasil Mid test	-	
8.	Thermomechanical treatment steels	Theoretical lecture/ OHP and white board	Student are able to explain of : Mekanisme thermommechanical and sifat material	Ch.9.3 ref. 5 Ch. 9 ref. 3	

Week	Course Topics	Lecturer Activity / Course Equipment	Criterion of Assessment	Reference	Presence
9.	Mechanical properties and experiment of Non Destruction Test	Theoretical lecture/ OHP and white board	Student are able to explain of : 1.Brittle and Fatique fracture 2. Prinsip NDT 2. Prinsip pengujian and analisa hasil	Ch 10 ref. 1	
10.	Electrical, Optical, dielectrical, magnetic properties	Theoretical lecture/ OHP and white board	Student are able to explain of : 1. Sifat listrik, magnetik 2. sifat dielektrik, optik	Ch 10,11 ,12 ref. 1	
11.	Thermal and chemical properties	Theoretical lecture/ OHP and white board	Student are able to explain of : 1. sifat ketahanan panas and jenisnya 2. sifat ketahanan tehadap lingkungan	Ch 13 and 15 ref. 1	
12.	Strength of material mechanism	Theoretical lecture/ OHP and white board	Student are able to explain of : Mekanisme penguatan pada material	Ch 6 ref. 3	
13.	Specific material , Tool steel, Super alloys, and stainless steel	Theoretical lecture/ OHP and white board	Student are able to explain of : Material yang dipakai dengan sifat khusus, tool steel, superalloys, baja tahan karat	Ch ,7,8,9,11,13 ref. 4	
14.	Group task	OHP and White board	Presentasi	-	
15.	Group task	OHP and White board	Presentasi	-	
16.	Final exam	Test di kelas	Hasil ujian	-	

STANDARD COURSE OUTLINE

Subject Title	:	**Structure and Properties of Material**
Subject Code/Credits	:	TKM 247 / 2
Semester	:	IV
Prerequisite	:	-
Brief Information	:	1. This subject is include in main subject of mechanical engineering 2. Course equipment : White board, OHP, In-focus, PC 3. Minimum student presence 75% 4. Student must read the handbook that is suggested by lecturer 5. Course method : Theoretical lecture, individual homework, group task, mid exam, and final exam

Evaluation Schedule and System of Assessment

Description of Assessment	Date	Time	Room	Rule	Value(%)
Student presence		In every class lecturer sessions		Min. 75 %	5
Individual homework		1 Week		Open book	10
Group task		3 Week		Open book	10
Mid exam		120 Minute		Open/close book	35
Ujian Akhir		120 Minute		Open/close book	40

Reference :

1. Schaffer James P., Saxena Ashok, The Science and Design of Engineering Materials, McGraw-Hgill,1999.
2. Calliester, Introduction of Material Engineering, McGraw-Hill Book, 1992
3. Dieter, Mechanical Metallurgy, McGraw-Hill, 1988
4. Petty, E.R., Physical Metallurgy of Engineering Materials, George Allen and Unwin,LTD, London, 1968
5. Smith William F., Principles of Materials Science and Engineering,McGraw-Hill, 1996.

Desirable Student Competency :

1. Student will understand and able to explain of Structure and Properties of Material
2. Student will understand and able to evaluate and applies material properties in engineering field
3. Student are able to improve and applies of material that is appropriate with technology development