	KEMENTERIAN RISET, TEKNOLOGI, DAN PENDIDIKAN TINGGI **UNIVERSITAS SRIWIJAYA** **FAKULTAS TEKNIK-PRODI MAGISTER TEKNIK MESIN** Jalan Srijaya Negara, Bukit Besar, Palembang 30139 Telpon (0711)-580272; Faximile (0711) 580272 E-mail: s2teknikmesin@ft.unsri.ac.id	**KODE DOKUMEN** **AQA TM-MTM24/2021**

RENCANA PEMBELAJARAN SEMESTER (RPS)

MATA KULIAH (MK)	KODE	BKU	BOBOT (SKS)		SEMESTER	TANGGAL PENYUSUNAN
PENGUKURAN DAN ANALISIS SINYAL GETARAN	**TKM5018**	**PERANCANGAN MESIN**		**3**	**2**	**2 Februari 2021**

OTORISASI	PENGEMBANG RPS	KOORDINATOR MK	KETUA PRODI
Gugus Kendali Mutu, Jurusan Teknik Mesin Unsri	Prof. Dipl.-Ing. Ir. Amrifan Saladin Mohruni, Ph.D.	Prof. Dipl.-Ing. Ir. Amrifan Saladin Mohruni, Ph.D.	Agung Mataram, S.T., M.T., Ph.D.

CAPAIAN PEMBELAJARAN (CP)

CAPAIAN PEMBELAJARAN LULUSAN (CPL)-PRODI-PROGRAM LEARNING OUTCOMES

Mampu menerapkan pengetahuan matematika, ilmu sains dasar serta dasardasar ilmu teknik, untuk mengidentifikasi, merumuskan, dan menyelesaikan bidang teknik mesin, Mampu merancang, melaksanakan eksperimen, menganalisis serta menafsirkan data yang diperoleh,, Mampu memanfaatkan metode,ketrampilan, dan peralatan teknik modern yang diperlukan untuk pekerjaan teknik,, Mampu berkomunikasi secara efektif, tidak hanya dengan sesama sarjana teknik tetapi juga dengan masyarakat luas, termasuk kemahiran dalam berbahasa asing (diutamakan bahasa Inggris),, Mampu bekerja secara efektif baik secara individual maupun dalam tim multidisiplin atau multi-budaya,

CAPAIAN PEMBELAJARAN MATA KULIAH (CPMK)-COURSES LEARNING OUTCOMES

CPMK:

PENGETAHUAN KOGNITIF (COGNITIVE KNOWLEDGE):

Mahasiswa memahami sifat-sifat sistem

BAB 1: pengenalan analisa dan pengukuran sinyal getaran.

BAB 2: sinyal dinamik dan sistem yaitu sinyal periodik berupa gelombang sinus, sinus kompleks, interaksi sinus dan ortogonalitas dari sinus.

-sinyal acak berupa, sinyal Transien, sinyal RMS dan daya;

-Linear Systems berupa transformasi laplace, fungsi transfer, reaksi impulse dan konvolusi.

-lanjutan transformasi fourier berupa karakter dari transformasi fourier, reaksi frekuensi, hubungan antara laplace dan domain frekuensi.

BAB 3: analisa data waktu yaitu pengenalan sinyal diskrit

-Teori Sampling berupa aliasing, Representasi diskrit dari sinyal analog, interpolasi dan resampling.

-Filter berupa anlaog filter, digital filter, filter smoothing, filter oktave akustik, integrasi RMS analog dan filter pembebasan frekuensi

-serial data analisis berupa analisa min dan maks, integrasi data waktu, diferensial data waktu, proses dasar FFT.

BAB 4: statistik dan proses acak yaitu

-pengenalan penggunaan statistik berupa ansambel dan rata-rata waktu, stasionaritas dan ergodisitas.

-teori acak berupa hasil yang diinginkan, estimasi eror, distribusi probabilitas, histogram, contoh estimasi probabilitas densiti, hasil rata-rata dan ragam, momen tengah, kecondongan, kurtosis, faktor puncak, fungsi korelasi, distribusi probabilitas gaus.

-metode statistik berupa pengujian hipotesis, normaliti, stsioner.

-Penilaian kualitas dari pengukuran sinyal

-Ringkasan Bab

-Soal-soal

-Daftar Pustaka

Bab 5: Mekanika fundamental

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RENCANA PEMBELAJARAN SEMESTER (RPS)

MATA KULIAH (MK)	KODE	BKU	BOBOT (SKS)		SEMESTER	TANGGAL PENYUSUNAN
PENGUKURAN DAN ANALISIS SINYAL GETARAN	**TKM5018**	**PERANCANGAN MESIN**		**3**	**2**	**2 Februari 2021**

OTORISASI	**PENGEMBANG RPS**	**KOORDINATOR MK**	**KETUA PRODI**
Gugus Kendali Mutu, Jurusan Teknik Mesin Unsri	Prof. Dipl.-Ing. Ir. Amrifan Saladin Mohruni, Ph.D.	Prof. Dipl.-Ing. Ir. Amrifan Saladin Mohruni, Ph.D.	Agung Mataram, S.T., M.T., Ph.D.

	-Hukum Newton -SDOF berupa fungsi transfer, respon impulse, respon frekuensi, faktor-Q, SDOF respons gaya. -Jumlah alternative untuk menggambarkan gerak -Format plot respons frekuensi berupa ; **PENGETAHUAN PSIKOMOTORIK (PSYCOMOTORIC KNOWLEDGE):** Upon successful completion of this subject students should be able to: 1. Explain the concepts and dynamic modelling methods of multi-rigid body systems and flexible body systems through theoretical derivation, explanation, demonstrations and the setting of tasks that exemplify what has been taught 2. Demonstrate proficiency in obtaining analytical and numerical solutions 3. Apply skills in instrumentation, measurement and signal processing - through vibration testing for several physical, mechanical and structural systems 4. Apply the learned vibration theory to solve engineering problems **PENGETAHUAN AFEKTIF (AFFECTIVE KNOWLEDGE):** Mahasiswa mampu bekerja dalam tim dalam menyelesaikan persoalan-persoalan keteknikan khususnya dalam bidang pengukuran dan analisa getaran **MATRIKS PENGETAHUAN KOGNITIF:** PENGETAHUAN FAKTUAL: (Remember (C1), Understand (C2), Apply (C3), Analyze (C4), Evaluate (C5); PENGETAHUAN KONSEPTUAL:(Remember (C1), Understand (C2), Apply (C3), Analyze (C4); PENGETAHUAN PROSEDURAL: (Remember (C1), Evaluate (C5); PENGETAHUAN META KOGNITIF: (Remember (C1), Understand (C2) **KEMAMPUAN SUB-CPMK (LESSON LEARNING OUTCOMES):** - **KONTEKS KEMAMPUAN:** -
DESKRIPSI SINGKAT MK	1. Vibration–Mathematical models. 2. Noise–Mathematical models. 3. Acoustical engineering. 4. Stochastic analysis. 5. Signal processing.

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RENCANA PEMBELAJARAN SEMESTER (RPS)

MATA KULIAH (MK)	KODE	BKU	BOBOT (SKS)		SEMESTER	TANGGAL PENYUSUNAN
PENGUKURAN DAN ANALISIS SINYAL GETARAN	**TKM5018**	**PERANCANGAN MESIN**		**3**	**2**	**2 Februari 2021**

OTORISASI	PENGEMBANG RPS	KOORDINATOR MK	KETUA PRODI
Gugus Kendali Mutu, Jurusan Teknik Mesin Unsri	Prof. Dipl.-Ing. Ir. Amrifan Saladin Mohruni, Ph.D.	Prof. Dipl.-Ing. Ir. Amrifan Saladin Mohruni, Ph.D.	Agung Mataram, S.T., M.T., Ph.D.

BAHAN KAJIAN/ MATERI PEMBELAJARAN	Special subject content may vary from semester to semester as it reflects student background knowledge, needs and interests and style of the teacher, but is likely to include: Free and forced vibration of multiple degrees of freedom (MDOF) damped mechanical and structural systems. Numerical methods such as transfer matrix method and finite element method for vibration analysis of continuous systems. Sensors often used for measurements of displacement, velocity and acceleration of multi-degrees of freedom systems; and the basics of data acquisition systems. Theoretical and analytical modal analysis of MDOF mechanical and structural systems; and vibration isolation and reduction of the mechanical and structural systems. Introduction to signal processing including windowing, filtering, spectrum analysis and the use of Labview for data acquisition and analysis. Introduction to acoustics, sensors and instrument systems most often used for evaluating noise level of an environment and measures for noise isolation. Special topics including, for example, experimental modal analysis, vehicle system dynamics, model reduction and modeling of journal bearings and turbomachinery nonlinear vibration. Special applications including torsional vibration of vehicle powertrain, vehicle suspension dynamics, and vibration of tall buildings
DAFTAR PUSTAKA	Brandt, Anders (2011), Noise and vibration analysis : signal analysis and experimental procedures, John Wiley & Sons, Ltd. Ewins, D. J. (2000), Modal Testing: Theory, Practice and Application, Research Stuhes Press Ltd. Agilent Technologies (2000), The Fundamentals of Modal Testing: Application Note 243 - 3, Agilent Technologies Agilent Technologies (2000), The Fundamentals of Signal Analysis: Application Note 243 Sinha, Jyoti Kumar (2015), Vibration Analysis,Instruments, and Signal Processing, Taylor & Francis Group, LLC, CRC Press de Silva, Clarence W. (2007), Vibration Monitoring, Testing, and Instrumentation,Taylor & Francis Group, LLC Hatch, Michael R. (2001), Vibration simulation using MATLAB and ANSYS, Chapman & Hall/CRC. S. S. Rao, Mechanical Vibrations, 4th Edition, 1078 pages, Prentice-Hall, Upper Saddle River, NJ, 2004. S. Goldman, Vibration Spectrum Analysis: A Practical Approach, Industrial Press, Incorporated, 1990. M. P. Norton, D. G. Karczub, Fundamentals of Noise and Vibration Analysis for Engineers (652 pages), Cambridge University Press, 2003. Nuno Manuel Mendes Maia, J.M. Motalvdao e Silva, Modal Analysis and Testing, Springer London, Limited, 1999. Robert Bond Randall, Vibration-based Condition Monitoring, Wiley, UK, 2011
DOSEN PENGAMPU	Prof. Dipl.-Ing. Ir. Amrifan Saladin Mohruni, Ph.D.
MATAKULIAH PRA-SYARAT	Tidak Ada

SATUAN ACARA PERKULIAHAN (SAP)						
No.	**Sub-CPMK (Kemampuan akhir tiap tahapan belajar)**	**Kemampuan akhir tiap pertemuan (Indikator Penilaian)**	**Bahan Kajian/ Materi Pembelajaran**	**Bentuk, Metode Pembelajaran & Penugasan + Waktu (min)**	**Kriteria dan Bentuk Penilaian**	**Bobot Penilaian (%)**
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
1.	Introduction Noise and Vibration	Mahasiswa memahami secara umum konsep, analisa dan aplikasi dari Noise dan Getaran,	Introduction 1.1 Noise and Vibration 1.2 Noise and Vibration Analysis 1.3 Application Areas 1.4 Analysis of Noise and Vibrations 1.4.1 Experimental Analysis	Kuliah dan Presentasi Introduction 1.1 Noise and Vibration 0:15:00 1.1 Noise and Vibration 1.2 Noise and Vibration Analysis 1.3 Application Areas 1.4 Analysis of Noise and Vibrations 1.4.1 Experimental Analysis 2:00:00 Question and Answer (QA) 0:15:00 Buku Text	Tugas Mandiri	
2.	Application Areas; Analysis of Noise and Vibrations	Mahasiswa memahami secara umum konsep, analisa dan aplikasi dari Noise dan Getaran,	1.5 Standards 1.6 Becoming a Noise and Vibration Analysis Expert 1.6.1 The Virtue of Simulation 1.6.2 Learning Tools and the Format of this Book	Kuliah dan Presentasi 1.5 Standards 0:30:00 1.6 Becoming a Noise and Vibration Analysis Expert 1.6.1 The Virtue of Simulation 1.6.2 Learning Tools and the Format of this Book 1:45:00 Question and Answer 0:15:00 1. Laptop 2. LCD-Projector 3. MATLAB 4. Wi-Fi Internet Connection 5. E-Learning Facility	Assignment 1	
3.	Mahasiswa memahami Sinyal Dinamik beserta Sistem yang terkait Mahasiswa memahami jenis-jenis sinyal periodic dan cara mengkondisikan agar sinyal dapat sesuai dengan kebutuhan proses berikutnya.	Mahasiswa memahami Sinyal Dinamik beserta Sistem yang terkait Mahasiswa memahami jenis-jenis sinyal periodic dan cara mengkondisikan agar sinyal dapat sesuai dengan kebutuhan proses berikutnya.	2 Dynamic Signals and Systems 2.1 Introduction 2.2 Periodic Signals 2.2.1 Sine Waves 2.2.2 Complex Sines 2.2.3 Interacting Sines 2.2.4 Orthogonality of Sines 2.3 Random Signals 2.4 Transient Signals 2.5 RMS Value and Power	Kuliah dan Presentasi serta E-Learning 2 Dynamic Signals and Systems 2.1 Introduction 0:15:00 2.2 Periodic Signals 2.2.1 Sine Waves 2.2.2 Complex Sines 2.2.3 Interacting Sines 2.2.4 Orthogonality of Sines 2.3 Random Signals	Assignment 2	

SATUAN ACARA PERKULIAHAN (SAP)						
No.	**Sub-CPMK (Kemampuan akhir tiap tahapan belajar)**	**Kemampuan akhir tiap pertemuan (Indikator Penilaian)**	**Bahan Kajian/ Materi Pembelajaran**	**Bentuk, Metode Pembelajaran & Penugasan + Waktu (min)**	**Kriteria dan Bentuk Penilaian**	**Bobot Penilaian (%)**
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
				2.4 Transient Signals 2.5 RMS Value and Power 2:00:00 Question and Answer 0:15:00 1. Laptop 2. LCD Projector 3. MATLAB 4. E-Learning 5. Wi-Fi Internet Connection		
4.	Mahasiswa memahami sistem linier Mahasiswa memahami transformasi sinyal melalui Transformasi Laplace Mahasiswa memahami transformasi sinyal melalui Transformasi Fourier Mahasiswa memahami hubungan Laplace dan Domain Frekwensi Mahasiswa memahami kondisi sinyal terkait	Mahasiswa memahami dan menjelaskan sistem linier Mahasiswa memahami dan menjelaskan transformasi sinyal melalui Transformasi Laplace Mahasiswa memahami dan menjelaskan transformasi sinyal melalui Transformasi Fourier Mahasiswa memahami dan menjelaskan hubungan Laplace dan Domain Frekwensi Mahasiswa memahami dan menjelaskan kondisi sinyal terkait	2.6 Linear Systems 2.6.1 The Laplace Transform 2.6.2 The Transfer Function 2.6.3 The Impulse Response 2.6.4 Convolution 2.7 The Continuous Fourier Transform 2.7.1 Characteristics of the Fourier Transform 2.7.2 The Frequency Response 2.7.3 Relationship between the Laplace and Frequency Domains 2.7.4 Transient versus Steady-state Response	Kuliah dan Presentasi serta E-Learning 2.6 Linear Systems 0:15:00 2.6.1 The Laplace Transform 2.6.2 The Transfer Function 2.6.3 The Impulse Response 2.6.4 Convolution 2.7 The Continuous Fourier Transform 2.7.1 Characteristics of the Fourier Transform 2.7.2 The Frequency Response 2.7.3 Relationship between the Laplace and Frequency Domains 2.7.4 Transient versus Steady-state Response 2:00:00 Question and Answer 0:15:00 1. Laptop 2. LCD Projector 3. MATLAB 4. E-Learning 5. Wi-Fi Internet Connection	Assignment 3	
5.	Mahasiswa memahami analisa data dalam time domain, termasuk cara mendapatkan data yang diinginkan. Mahasiswa memahami cara mengkondisikan sinyal dengan memanfaatkan berbagai jenis filter yang lazim digunakan	Mahasiswa mampu memahami analisa data dalam time domain, termasuk cara mendapatkan data yang diinginkan. Mahasiswa mampu memahami cara mengkondisikan sinyal dengan memanfaatkan berbagai jenis filter yang lazim digunakan	3 Time Data Analysis 3.1 Introduction to Discrete Signals 3.2 The Sampling Theorem 3.2.1 Aliasing 3.2.2 Discrete Representation of Analog Signals 3.2.3 Interpolation and Resampling	Kuliah, Presentasi dan diskusi 3 Time Data Analysis 0:15:00 3.1 Introduction to Discrete Signals 3.2 The Sampling Theorem 3.2.1 Aliasing 3.2.2 Discrete Representation of Analog Signals 3.2.3 Interpolation and Resampling	Assignment 4	

SATUAN ACARA PERKULIAHAN (SAP)						
No.	**Sub-CPMK (Kemampuan akhir tiap tahapan belajar)**	**Kemampuan akhir tiap pertemuan (Indikator Penilaian)**	**Bahan Kajian/ Materi Pembelajaran**	**Bentuk, Metode Pembelajaran & Penugasan + Waktu (min)**	**Kriteria dan Bentuk Penilaian**	**Bobot Penilaian (%)**
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
			3.3 Filters 3.3.1 Analog Filters 3.3.2 Digital Filters 3.3.3 Smoothing Filters 3.3.4 Acoustic Octave Filters 3.3.5 Analog RMS Integration 3.3.6 Frequency Weighting Filters	2:00:00 Question and Answer 0:15:00 1. Laptop 2. LCD Projector 3. MATLAB 4. E-Learning 5. Wi-Fi Internet Connection		
6.	Mahasiswa memahami Penggunaan Statistik Mahasiswa mahasiswa Teori Random Mahasiswa memahami Metoda Statistik Mahasiswa memahami Asesmen Kualitas dari Sinyal Ukur	Mahasiswa mampu memahami Penggunaan Statistik Mahasiswa mampu mahasiswa Teori Random Mahasiswa mampu memahami Metoda Statistik Mahasiswa mampu memahami Asesmen Kualitas dari Sinyal Ukur	Statistics and Random Processes 4.1 Introduction to the Use of Statistics 4.1.1 Ensemble and Time Averages 4.1.2 Stationarity and Ergodicity 4.2 Random Theory 4.2.1 Expected Value 4.2.2 Errors in Estimates 4.2.3 Probability Distribution 4.2.4 Probability Density 4.2.5 Histogram 4.2.6 Sample Probability Density Estimate 4.2.7 Average Value and Variance 4.2.8 Central Moments 4.2.9 Skewness 4.2.10 Kurtosis 4.2.11 Crest Factor 4.2.12 Correlation Functions 4.2.13 The Gaussian Probability Distribution 4.3 Statistical Methods 4.3.1 Hypothesis Tests 4.3.2 Test of Normality 4.3.3 Test of Stationarity 4.4 Quality Assessment of Measured Signals	Kuliah dan Presntasi Statistics and Random Processes 4.1 Introduction to the Use of Statistics 0:15:00 4.1.1 Ensemble and Time Averages 4.1.2 Stationarity and Ergodicity 4.2 Random Theory 4.2.1 Expected Value 4.2.2 Errors in Estimates 4.2.3 Probability Distribution 4.2.4 Probability Density 4.2.5 Histogram 4.2.6 Sample Probability Density Estimate 4.2.7 Average Value and Variance 4.2.8 Central Moments 4.2.9 Skewness 4.2.10 Kurtosis 4.2.11 Crest Factor 4.2.12 Correlation Functions 4.2.13 The Gaussian Probability Distribution 4.3 Statistical Methods 4.3.1 Hypothesis Tests 4.3.2 Test of Normality 4.3.3 Test of Stationarity 4.4 Quality Assessment of Measured Signals 2:10:00 Question and Answer 0:05:00 1. Laptop 2. LCD Projector 3. MATLAB	Assignment 5	

SATUAN ACARA PERKULIAHAN (SAP)						
No.	**Sub-CPMK (Kemampuan akhir tiap tahapan belajar)**	**Kemampuan akhir tiap pertemuan (Indikator Penilaian)**	**Bahan Kajian/ Materi Pembelajaran**	**Bentuk, Metode Pembelajaran & Penugasan + Waktu (min)**	**Kriteria dan Bentuk Penilaian**	**Bobot Penilaian (%)**
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
				4. E-Learning 5. Wi-Fi Internet Connection		
7.	Mahasiswa memahami dasar-dasar mekanika Mahasiswa memahami Single Degree of Freedom (SDOF)	Mahasiswa mampu memahami dasar-dasar mekanika Mahasiswa mampu memahami Single Degree of Freedom (SDOF)	Fundamental Mechanics 5.1 Newton's Laws 5.2 The Single Degree-of-freedom System (SDOF) 5.2.1 The Transfer Function 5.2.2 The Impulse Response 5.2.3 The Frequency Response 5.2.4 The Q-factor 5.2.5 SDOF Forced Response 5.3 Alternative Quantities for Describing Motion	Kuliah dan Presentasi Fundamental Mechanics 5.1 Newton's Laws 5.2 The Single Degree-of-freedom System (SDOF) 0:15:00 5.2.1 The Transfer Function 5.2.2 The Impulse Response 5.2.3 The Frequency Response 5.2.4 The Q-factor 5.2.5 SDOF Forced Response 5.3 Alternative Quantities for Describing Motion 2:00:00 Question and Answer 0:15:00 1. Laptop 2. LCD Projector 3. MATLAB 4. E-Learning 5. Wi-Fi Internet Connection	Assignment 6	
8.	Mahasiswa memahami Format Plot Response Mahasiswa memahami Nyquist Plot Mahasiswa memahami Rotating Mass Motion Mahasiswa memahami Isolasi Vibrasi Mahasiswa memahami 2DOF	Mahasiswa mampu memahami Format Plot Response Mahasiswa mampu memahami Nyquist Plot Mahasiswa mampu memahami Rotating Mass Motion Mahasiswa mampu memahami Isolasi Vibrasi Mahasiswa mampu memahami 2DOF	5.4 Frequency Response Plot Formats 5.4.1 Magnitude and Phase 5.4.2 Real and Imaginary Parts 5.4.3 The Nyquist Plot – Imaginary vs. Real Part 5.5 Determining Natural Frequency and Damping 5.5.1 Peak in the Magnitude of FRF 5.5.2 Peak in the Imaginary Part of FRF 5.5.3 Resonance Bandwidth (3 dB Bandwidth) 5.5.4 Circle in the Nyquist Plot 5.6 Rotating Mass 5.7 Some Comments on Damping 5.7.1 Hysteretic Damping 5.8 Models Based on SDOF	Kuliah dan Presentasi serta E-Learning 5.4 Frequency Response Plot Formats 5.4.1 Magnitude and Phase 5.4.2 Real and Imaginary Parts 12:15:00 AM 5.4.3 The Nyquist Plot – Imaginary vs. Real Part 5.5 Determining Natural Frequency and Damping 5.5.1 Peak in the Magnitude of FRF 5.5.2 Peak in the Imaginary Part of FRF 5.5.3 Resonance Bandwidth (3 dB Bandwidth) 5.5.4 Circle in the Nyquist Plot 5.6 Rotating Mass 5.7 Some Comments on Damping 5.7.1 Hysteretic Damping 5.8 Models Based on SDOF	Assignment 7	

SATUAN ACARA PERKULIAHAN (SAP)						
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(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
			Approximations 5.8.1 Vibration Isolation 5.8.2 Resonance Frequency and Stiffness Approximations 5.9 The Two-degree-of-freedom System (2DOF) 5.10 The Tuned Damper	Approximations 5.8.1 Vibration Isolation 5.8.2 Resonance Frequency and Stiffness Approximations 5.9 The Two-degree-of-freedom System (2DOF) 5.10 The Tuned Damper 2:10:00 AM Question and Answer 12:05:00 AM 1. Laptop 2. LCD Projector 3. MATLAB 4. E-Learning 5. Wi-Fi Internet Connection		
9.	Mahasiswa memahami perhitungan analisa modal pada vibrasi SDOF	Mahasiswa mampu memahami perhitungan analisa modal pada vibrasi SDOF	Modal Analysis Theory 6.1 Waves on a String 6.2 Matrix Formulations 6.2.1 Degree-of-freedom 6.3 Eigenvalues and Eigenvectors 6.3.1 Undamped System 6.3.2 Mode Shape Orthogonality 6.3.3 Modal Coordinates 6.3.4 Proportional Damping 6.3.5 General Damping	Kuliah dan Presentasi Modal Analysis Theory 6.1 Waves on a String 12:15:00 AM 6.2 Matrix Formulations 6.2.1 Degree-of-freedom 6.3 Eigenvalues and Eigenvectors 6.3.1 Undamped System 6.3.2 Mode Shape Orthogonality 6.3.3 Modal Coordinates 6.3.4 Proportional Damping 6.3.5 General Damping 2:00:00 AM Question and Answer 12:15:00 AM 1. Laptop 2. LCD Projector 3. MATLAB 4. E-Learning 5. Wi-Fi Internet Connection	Assignment 8	
10.	Mahasiswa memahami Response Frekwensi dari Sistem MDOF Mahasiswa memahami Mode Shape sistem Vibrasi Mahasiswa memahami Simulasi Response Vibrasi Paksa	Mahasiswa mampu memahami Response Frekwensi dari Sistem MDOF Mahasiswa mampu memahami Mode Shape sistem Vibrasi Mahasiswa mampu memahami Simulasi Response Vibrasi Paksa	Frequency Response of MDOF Systems 6.4.1 Frequency Response from [M], [C], [K] 6.4.2 Frequency Response from Modal Parameters 6.4.3 Frequency Response from	Kuliah dan Presentasi Frequency Response of MDOF Systems 6.4.1 Frequency Response from [M], [C], [K] 12:15:00 AM 6.4.2 Frequency Response from Modal	Assignment 9	

SATUAN ACARA PERKULIAHAN (SAP)						
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(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
			[M], [K], and ζ – Modal Damping 6.4.4 Mode Shape Scaling 6.4.5 The Effect of Node Lines on FRFs 6.4.6 Anti resonance 6.4.7 Impulse Response of MDOF Systems 6.5 Time Domain Simulation of Forced Response	Parameters 6.4.3 Frequency Response from [M], [K], and ζ – Modal Damping 6.4.4 Mode Shape Scaling 6.4.5 The Effect of Node Lines on FRFs 6.4.6 Anti resonance 6.4.7 Impulse Response of MDOF Systems 6.5 Time Domain Simulation of Forced Response 2:00:00 AM Question and Answer 12:15:00 AM 1. Laptop 2. LCD Projector 3. MATLAB 4. E-Learning 5. Wi-Fi Internet Connection		
11.	Mahasiswa memahami Transduser untuk Analisa Vibrasi dan Noise	Mahasiswa mampu memahami Transduser untuk Analisa Vibrasi dan Noise	Transducers for Noise and Vibration Analysis 7.1 The Piezoelectric Effect 7.2 The Charge Amplifier 7.3 Transducers with Built-In Impedance Converters, 'IEPE' 7.3.1 Low-frequency Characteristics 7.3.2 High-frequency Characteristics 7.3.3 Transducer Electronic Data Sheet, TEDS 7.4 The Piezoelectric Accelerometer 7.4.1 Frequency Characteristics 7.4.2 Mounting Accelerometers 7.4.3 Electrical Noise 7.4.4 Choosing an Accelerometer 7.5 The Piezoelectric Force Transducer 7.6 The Impedance Head 7.7 The Impulse Hammer 7.8 Accelerometer Calibration	Kuliah dan Presentasi Transducers for Noise and Vibration Analysis 7.1 The Piezoelectric Effect 7.2 The Charge Amplifier 12:15:00 AM 7.3 Transducers with Built-In Impedance Converters, 'IEPE' 7.3.1 Low-frequency Characteristics 7.3.2 High-frequency Characteristics 7.3.3 Transducer Electronic Data Sheet, TEDS 7.4 The Piezoelectric Accelerometer 7.4.1 Frequency Characteristics 7.4.2 Mounting Accelerometers 7.4.3 Electrical Noise 7.4.4 Choosing an Accelerometer 7.5 The Piezoelectric Force Transducer 7.6 The Impedance Head 7.7 The Impulse Hammer 7.8 Accelerometer Calibration 7.9 Measurement Microphones	Assignment 10	

SATUAN ACARA PERKULIAHAN (SAP)						
No.	**Sub-CPMK (Kemampuan akhir tiap tahapan belajar)**	**Kemampuan akhir tiap pertemuan (Indikator Penilaian)**	**Bahan Kajian/ Materi Pembelajaran**	**Bentuk, Metode Pembelajaran & Penugasan + Waktu (min)**	**Kriteria dan Bentuk Penilaian**	**Bobot Penilaian (%)**
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
			7.9 Measurement Microphones 7.10 Microphone Calibration 7.11 Shakers for Structure Excitation 7.12 Some Comments on Measurement Procedures	7.10 Microphone Calibration 7.11 Shakers for Structure Excitation 7.12 Some Comments on Measurement Procedures 2:10:00 AM Question and Answer 12:05:00 AM 1. Laptop 2. LCD Projector 3. MATLAB 4. E-Learning 5. Wi-Fi Internet Connection		
12.	Mahasiswa memahami Teori Analisa Frekwensi Mahasiswa memahami Interpretasi Spektrum	Mahasiswa mampu memahami Teori Analisa Frekwensi Mahasiswa mampu memahami Interpretasi Spektrum	Frequency Analysis Theory 8.1 Periodic Signals – The Fourier Series 8.2 Spectra of Periodic Signals 8.2.1 Frequency and Time 8.3 Random Processes 8.3.1 Spectra of Random Processes 8.4 Transient Signals 8.5 Interpretation of spectra	Kuliah dan Presentasi Frequency Analysis Theory 8.1 Periodic Signals – The Fourier Series 12:15:00 AM 8.2 Spectra of Periodic Signals 8.2.1 Frequency and Time 8.3 Random Processes 8.3.1 Spectra of Random Processes 8.4 Transient Signals 8.5 Interpretation of spectra 2:00:00 AM Question and Answer 12:15:00 AM 1. Laptop 2. LCD Projector 3. MATLAB 4. White Board 5. Wi-Fi Internet Connection	Assignment 11	
13.	Mahasiswa memahami Analisa Frekwensi Experimental	Mahasiswa mampu memahami Analisa Frekwensi Experimental	Experimental Frequency Analysis 9.1 Frequency Analysis Principles 9.1.1 Nonparametric Frequency Analysis 9.2 Octave and Third-octave Band Spectra 9.2.1 Time Constants 9.2.2 Real-time versus Serial	Kuliah dan Presentasi Experimental Frequency Analysis 9.1 Frequency Analysis Principles 9.1.1 Nonparametric Frequency Analysis 12:15:00 AM 9.2 Octave and Third-octave Band Spectra	Assignment 12	

SATUAN ACARA PERKULIAHAN (SAP)						
No.	**Sub-CPMK (Kemampuan akhir tiap tahapan belajar)**	**Kemampuan akhir tiap pertemuan (Indikator Penilaian)**	**Bahan Kajian/ Materi Pembelajaran**	**Bentuk, Metode Pembelajaran & Penugasan + Waktu (min)**	**Kriteria dan Bentuk Penilaian**	**Bobot Penilaian (%)**
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
			Measurements 9.3 The Discrete Fourier Transform (DFT) 9.3.1 The Fast Fourier Transform, FFT 9.3.2 The DFT in Short 9.3.3 The Basis of the DFT 9.3.4 Periodicity of the DFT 9.3.5 Properties of the DFT 9.3.6 Relation between DFT and Continuous Spectrum 9.3.7 Leakage 9.3.8 The Picket-fence Effect 9.3.9 Time Windows for Periodic Signals 9.3.10 Time Windows for Random Signals 9.3.11 Oversampling in FFT Analysis 9.3.12 Circular Convolution and Aliasing 9.3.13 Zero Padding 9.3.14 Zoom FFT	9.2.1 Time Constants 9.2.2 Real-time versus Serial Measurements 9.3 The Discrete Fourier Transform (DFT) 9.3.1 The Fast Fourier Transform, FFT 9.3.2 The DFT in Short 9.3.3 The Basis of the DFT 9.3.4 Periodicity of the DFT 9.3.5 Properties of the DFT 9.3.6 Relation between DFT and Continuous Spectrum 9.3.7 Leakage 9.3.8 The Picket-fence Effect 9.3.9 Time Windows for Periodic Signals 9.3.10 Time Windows for Random Signals 9.3.11 Oversampling in FFT Analysis 9.3.12 Circular Convolution and Aliasing 9.3.13 Zero Padding 9.3.14 Zoom FFT 2:00:00 AM Question and Answer 12:05:00 AM 1. Laptop 2. LCD-Projector 3. MATLAB 4. Wi-Fi Internet Connection 5. E-Learning Facility		
14.	Mahasiswa memahami Sistem Analisa dan Pengukuran Mahasiswa memahami Perangkat Keras dan Lunak Sistem Mahasiswa memahami Pengkondisian Sinyal	Mahasiswa mampu memahami Sistem Analisa dan Pengukuran Mahasiswa mampu memahami Perangkat Keras dan Lunak Sistem Mahasiswa mampu memahami Pengkondisian Sinyal	Measurement and Analysis Systems 11.1 Principal Design 11.2 Hardware for Noise and Vibration Analysis 11.2.1 Signal Conditioning 11.2.2 Analog-to-digital Conversion, ADC 11.2.3 Practical Issues	Kuliah dan Presentasi Measurement and Analysis Systems 11.1 Principal Design 12:15:00 AM 11.2 Hardware for Noise and Vibration Analysis 11.2.1 Signal Conditioning 11.2.2 Analog-to-digital Conversion, ADC	Assignment 12	

SATUAN ACARA PERKULIAHAN (SAP)						
No.	**Sub-CPMK (Kemampuan akhir tiap tahapan belajar)**	**Kemampuan akhir tiap pertemuan (Indikator Penilaian)**	**Bahan Kajian/ Materi Pembelajaran**	**Bentuk, Metode Pembelajaran & Penugasan + Waktu (min)**	**Kriteria dan Bentuk Penilaian**	**Bobot Penilaian (%)**
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
			11.2.4 Hardware Specifications 11.2.5 Transient (Shock) Recording 11.3 FFT Analysis Software 11.3.1 Block Processing 11.3.2 Data Scaling 11.3.3 Triggering 11.3.4 Averaging 11.3.5 FFT Setup Parameters	11.2.3 Practical Issues 11.2.4 Hardware Specifications 11.2.5 Transient (Shock) Recording 11.3 FFT Analysis Software 11.3.1 Block Processing 11.3.2 Data Scaling 11.3.3 Triggering 11.3.4 Averaging 11.3.5 FFT Setup Parameters 2:00:00 AM Question and Answer 12:15:00 AM 1. Laptop 2. LCD-Projector 3. MATLAB 4. Wi-Fi Internet Connection 5. E-Learning Facility		
15.	Mahasiswa memahami analisa vibrasi rotating mesin	Mahasiswa mampu memahami analisa vibrasi rotating mesin	Rotating Machinery Analysis 12.1 Vibrations in Rotating Machines 12.2 Understanding Time–Frequency Analysis 12.3 Rotational Speed Signals (Tachometer Signals) 12.4 RPM Maps 12.4.1 The Waterfall Plot 12.4.2 The Color Map Plot 12.5 Smearing 12.6 Order Tracks 12.7 Synchronous Sampling 12.7.1 DFT Parameters after Resampling 12.8 Averaging Rotation-speed-dependent Signals 12.9 Adding Change in RMS with Time 12.10 Parametric Methods	Kuliah dan Presentasi Rotating Machinery Analysis 12.1 Vibrations in Rotating Machines 12:10:00 AM 12.2 Understanding Time–Frequency Analysis 12.3 Rotational Speed Signals (Tachometer Signals) 12.4 RPM Maps 12.4.1 The Waterfall Plot 12.4.2 The Color Map Plot 12.5 Smearing 12.6 Order Tracks 12.7 Synchronous Sampling 12.7.1 DFT Parameters after Resampling 12.8 Averaging Rotation-speed-dependent Signals 12.9 Adding Change in RMS with Time 12.10 Parametric Methods 2:10:00 AM Question and Answer	Assignment 14	

SATUAN ACARA PERKULIAHAN (SAP)						
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(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
				12:05:00 AM 1. Laptop 2. LCD-Projector 3. MATLAB 4. Wi-Fi Internet Connection 5. E-Learning Facility		
16.	Ujian Akhir Semester (UAS)	Ujian Akhir Semester (UAS)	Ujian Akhir Semester (UAS)	Ujian Akhir Semester (UAS) Pembagian Soal Ujian Akhir Semester (UAS) 12:05:00 AM Ujian Akhir Semester (UAS) 2:20:00 AM Pengumpulan Hasil Ujian Akhir Semester (UAS) 12:05:00 AM Pengumpulan Hasil Ujian Akhir Semester (UAS)	Nilai Pengumpulan Hasil Ujian Akhir Semester (UAS)	

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