Heaven's light is our guide

Rajshahi University of Engineering & Technology

MTE 1101

Mechatronic Systems

Prepared By:

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Outlines

- Syllabus.
- Recommended Books.
- Course Teachers.
- Weekly Routine.
- Grading System
- Course Registration Form.
- Join your google classroom.

Syllabus

MTE 1101 (Mechatronic Systems)

Lecture: 3 hrs. /week **No. of credit: 3.00**

Introduction: Definitions of Mechatronics, Overview of different Mechatronic systems, Scope and applications of Mechatronics.

Sensors and transducers: Basic principles of potentiometer, op-amps, Wheatstone bridge, introduction to sensors and transducers, sensor terminologies, sensor characteristics, classification of sensors, proximity sensors.

System Modeling and Control: Introduction to signals and systems, Modeling of Mechanical, Electrical, Fluid and Thermal systems, Linearization of nonlinear systems, Rotational-translational systems, Electro-Mechanical systems and Hydraulic-Mechanical System. Basic components of Control system, Types of control system, System representation, System responses, Time constant, Measurement of system performance, Transfer function, Block diagram and Illustrative examples.

Actuation systems: Linear and rotary actuators. AC and DC motors, Solenoids, Stepper motor, Fluid power actuators and Smart actuators.

Recent trends in Mechatronic systems.

Recommended Books

Textbook:

1. Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering by **W. Bolton**. [pdf]

Reference Books:

1. A Textbook of Mechatronics by **RK Rajput**. [pdf]
2. Mechatronics: An Integrated Approach by Clarence W. De Silva. [pdf]

Course Teachers

- **Prangon Das**, Lecturer Dept of MTE, RUET**: Section A: Introduction, Sensors and transducers, Actuation systems,** Recent trends in Mechatronic systems.

- **Subrata Kumar Sarker,** Lecturer, Dept of MTE, RUET: **Section B: System Modeling and Control**

Weekly Routine

Day	Saturday								
Period	1	2	3	4	5	6	7	8	9
16 Series AICSL	CSE 4281 MHA	MTE 4209(a) MRZ	MTE 4203 SKD				MTE 4206 FRB/MRI (RAL)		
17 Series R-405				ME 3265 PD	MTE 3205 SHA	ME 3255 FRB			
18 Series R-404	ME 3156 MZS (ML)			Math 3127 MBH	MTE 3155 FRB	MTE 3101 SKS	MTE 3104 PD/MMI (CSL)		
19 Series R-404	ME 2155 MRI/PD	CSE 2187 FRB	EEE 2187 MFA	EEE 2188 MFA/MMI (RAL)					
20 Series R-405	MTE 1101 SKS /PD	Hum 1127 MGM	Phy 1127 MRA	ME 1130 MRI (CSL)					

Day	Sunday								
Period	1	2	3	4	5	6	7	8	9
16 Series AICSL	CSE 4281 MMH/MHA	MTE 4207 SKS	MTE 4209(a) MRZ						
17 Series R-405				ME 3255 MRI	EEE 3287 MMH	ME 3265 PD/MHA	ME 3256 MRZ (ML)		
18 Series R-404	MTE 3155 MRI	MTE 3101 ZT	MTE 3105 SHA/MHA				MTE 3104 PD/MMI (CSL)		
19 Series R-404	EEE 2188 MMI/MFA (RAL)			ME 2155 PD	Math 2127 MSA	Hum 2127 ABS			
20 Series R-405	Math 1127 MAA	Chem 1127 TKP	MTE 1101 PD				ME 1130 MRI (R: 405)		

Day	Monday								
Period	1	2	3	4	5	6	7	8	9
16 Series AICSL				MTE 4203 SHA	MTE 4205 FRB	MTE4207 PD			
17 Series R-405	EEE 3287 MMI	MTE 3201 ZT	MTE 3205 SHA/SKD				MTE 3202 ZT/SKS (AICSL)		
18 Series R-404				MTE 3103 PD/MMH	MTE 3105 MHA	MTE 3101 ZT/SKS	MTE 3106 MHA/SHA (CSL)		
19 Series R-404	CSE 2187 MMH	EEE 2187 MFA/MMI	ME 2155 MRI	ME 2130 MRI (CSL)			CSE 2188 FRB/MMH (RAL)		
20 Series R-405	MTE 1102 PD/SKS (CSL)			Phy 1127 MRA	Chem 1127 MSA	Hum 1127 MGM	Chem 1128		MSA

Day	Tuesday								
Period	1	2	3	4	5	6	7	8	9
16 Series AICSL	MTE 4200			MTE 4205 MRI	MTE 4203 SKS/SHA	CSE 4281 MMH	MTE 4210		
17 Series R-405				EEE 3287 MMI/MMH	ME 3265 MHA	MTE 3201 SKS			
18 Series R-404				MTE 3103 PD	Math 3127 MMI	MTE 3155 MRI/FRB			
19 Series R-404	Hum 2127 MMP	CSE 2187 MMH/FRB	Math 2127 MSA	ME 2156 MMK (ML)					
20 Series R-405	Hum 1127 MGM	Math 1127 MN	Phy 1127 MSP						

Day	Wednesday								
Period	1	2	3	4	5	6	7	8	9
16 Series AICSL	MTE 4204 PD/SHA (CSL)			MTE 4205 FRB/MRI	MTE 4207 PD/SKS	MTE 4209(a) MRZ			
17 Series R-405				MTE 3201 ZT/SKS	MTE 3205 SKD	ME 3255 MRI/FRB	MTE 3200		
18 Series R-404				MTE 3103 MMH	MTE 3105 SHA	Math 3127 MMI/MBH	MTE 3102 SKS/FRB (R: 404)		
19 Series R-404	Hum 2127 MMP	MATH 2127 MZA	EEE 2187 MMI				MTE 2130 MRI (CSL)		
20 Series R-405	MTE 1101 SKS	Chem 1127 TKP	Math 1127 MAA	Phy 1128 MNZ/ MJ					

Teacher's Name

SKD: Dr. Sajal Kumar Das
MFA: Md. Firoj Ali
ZT: Zinat Tasneem
MMI: Md. Manirul Islam
MRI: Md. Robiul Islam
FRB: Faisal Rahman Badal
MHA: Md. Hafiz Ahamed
SHA: Sarafat Hussain Abhi
SKS: Subrata Kumar Sarker
PD: Prangon Das
MMH: Md. Mehedi Hasan

Name of the Laboratories:

CSL: Computer & Simulation Lab
AICSL: Artificial Intelligence & Control System Lab
RAL: Robotics & Automation Lab
ML: Metrology Lab

Teacher's Name

MSA: Prof. Dr. Md. Shamsul Alam
MBH: Prof. Dr. Md. Bellal Hossain
MRZ: Prof. Dr. Md. Rokunuzzaman
MZS: Prof. Dr. Mhia Md. Zaglul Shahadat
MNZ: Prof. Dr. Md. Nuruzzaman
ABS: Prof. Md. Abu Bakar Siddique
TKP: Prof. Dr. Tarun Kumar Paul
MMK: Md. Mostafa Kamal
MZA: Md. Zahangir Alom
MN: Md. Nuruzzaman
MRA: Md. Rahat Ali
MSP: Md. Sarwar Pervez
MMP: Mst. Mitu Pervin
MGM: Md. Golam Mostakim
MAA: Md. Abdul Alim
MJ: Md. Jubair
*** Names are not arranged according to seneriety.

Grading System

Numerical grade	Letter grade	Grade point
80% or above	A+ (A Plus)	4.0
75% to less than 80%	A (A Regular)	3.75
70% to less than 75%	A- (A Minus)	3.5
65% to less than 70%	B+ (B Plus)	3.25
60% to less than 65%	B (B Regular)	3.0
55% to less than 60%	B- (B Minus)	2.75
50% to less than 55%	C+ (C Plus)	2.5
45% to less than 50%	C (C Regular)	2.25
40% to less than 45%	D	2.0
Less than 40%	F	0
Incomplete	I	-
Need to register again	--	-

The distribution of marks for a given course is as follows:

Theory courses:

- Class participation and attendance 10
- Class tests 20
- Assignment/Group work/Case study /Oral presentation/Project design 10

- Semester Final Examination 60

Total = 100

Subject to the approval of academic council

Sample Question

Heaven's Light is Our Guide

Rajshahi University of Engineering & Technology

Department of Mechatronics Engineering

B.Sc. Engineering 4th Year ODD Semester Examination 2017

Course No: MTE 4103 — Course Title: **Digital Signal Processing & Machine Vision**

Full Marks: 72 — Time: Three Hours

N.B. i) Answer any **Six** questions, taking **Three** from each section.
ii) Figures in the margin indicate full marks.
iii) Use separate answer script for each section.

SECTION-A

Q.1(a) What do you know by digital signal processing? What are the relative advantages and disadvantages of digital signal processing over analog signal processing? 04

(b) Draw the basic diagram of a typical DSP system. Explain the functions of each block. 04

(c) Using basic blocks included by DSP, sketch the block diagram representation of discrete time system described by the input-output relation. 04

$$y(n) = \frac{1}{2}y(n-1) + \frac{1}{2}x(n) + \frac{1}{4}x(n-1)$$

where $x(n)$ is the input and $y(n)$ is the output of the system.

Q.2(a) Define Z Transform. State and explain time reversal property of Z transform. 04

(b) Determine the Z-transform of the signal 04

$$x(n) = a^n u(n) = \begin{cases} a^n, & n \geq 0 \\ 0, & n < 0 \end{cases}$$

(c) State and explain the Linearity and time reversal property of DFT. 04

Q.3(a) Define Convolution and De-convolution operation in DSP. Write some applications of convolution in DSP. 04

(b) What is auto correlation function? Discuss the auto correlation function for energy signal and power signal. 04

(c) Determine the cross correlation sequence $r_{xy}(l)$ of the sequences. 04

$$x(n) = \{\ldots 0, 0, 2, -1, 3, 7, 1, 2, -3, 0, 0 \ldots\}$$
$$\uparrow$$
$$y(n) = \{\ldots 0, 0, 1, \quad -1, 2, -2, 4, 1, -2, 5, 0, 0 \ldots\}$$
$$\uparrow$$

Q.4(a) What do you know about digital filtering? What are the applications of digital filter? 03

(b) Define FIR system. Discuss the FIR system for any structure. 04

(c) Describe the design method of Linear phase FIR filter using windows method. 05

SECTION-B

Q.5(a) What do you mean by Machine Vision? Describe the machine vision operation by a four step flow. 04

(b) Define digital image processing. Write down the advantages and disadvantages of digital image processing. 04

(c) Name some image acquisition (vision) sensors. Explain any one type of vision sensor 04

Q.6(a) Draw the block diagram of a typical image analysis system and explain functions of each block. 04

(b) How image can be enhanced? Explain histogram modeling for image enhancement. 04

(c) What are image transforms? Why these transforms are needed? 04

Q.7(a) What is feature extraction? How it is helpful in machine vision? 04

(b) Explain the flow chart of Canny Edge detector. What advantages are offered by this detector? 04

(c) How images are coded? What are the factors which need to be considered when coding images? 04

Q.8(a) What is object recognition? Why it is so difficult in machine vision tasks? 04

(b) What are the three main issues of object recognition? Give an example of how object can be categorized? 04

(c) What is machine learning? How it is helpful to recognize objects? 04

Course Registration Form

Heaven's Light is Our Guide

RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY, BANGLADESH

Course Registration/Course Adjustment Form

.....Department.

Roll No:.....Registration No. with Session:.....

Name:.....

Academic session with Semester:.....Previously earned credit:.....

Course No. of Backlog Courses	

Courses to be registered in this semester:

Course No.	Course Title	Credit
	Total credit of this Semester	

Adviser's Comments (if any).....

.....

Signature of the Student Signature of the Adviser Signature of the Controller

Date:

Students are asked to cross out irrelevant Terms.

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- Click + icon at the upper right corner
- Join Class
- Class Code: zpbrhyt
- Class Link: https://classroom.google.com/c/NDc4MzEzNDY3Nzk4?cjc=zpbrhyt

To Be Continued…..

THANK YOU