

# Rajshahi University of Engineering & Technol

#### **MTE 1101**

# Mechatronic Systems

Prepared By:

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Rajshahi University of Engineering & Technology.

#### 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

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

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

Linearization of nonlinear systems, Rotational-translational systems, Electro-Mechanical systems and Hydraulic-Mec components of Control system, Types of control system, System representation, System responses, Time constant, N System Modeling and Control: Introduction to signals and systems, Modeling of Mechanical, Electrical, Fluid performance, Transfer function, Block diagram and Illustrative examples. Actuation systems: Linear and rotary actuators. AC and DC motors, Solenoids, Stepper motor, Fluid power actuators a

Recent trends in Mechatronic systems.

12-Mar-22

MTE 1101: Mechatronic Systems

# Recommended Books

#### Textbook:

1. Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering by W. Bolton.

#### Reference Books:

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

Prangon Das, Lecturer, Dept. of MTE, RUET MTE 1101: Mechatronic Systems

## Course Teachers

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

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

12-Mar-22

## Weekly Routine

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MTE 1101: Mechatronic Systems

### **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%	щ	0
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Need to register again	I	•

The distribution of marks for a given c follows:

Theory courses:

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

## ❖Semester Final Examination

Total

11

Subject to the approval of academic counci

## Sample Question

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Answer any Six questions, taking Three from each section.  SECTION-A  What do you know by digial signal processing over analog signal processing?  Use separate answer script for each section.  SECTION-A  What do you know by digial signal processing over analog signal processing?  Draw the basic digital signal processing over analog signal processing?  Using basic blocks included by DSF, select the block diagram representation of discrete time system described by the input and typical DSF system. By plain the functions of each block.  Using basic blocks included by DSF, select the block diagram representation of discrete time system described by the input and y(n) is the output of the system.  Define Y. Transform. State and explain time reversal property of Z transform.  Define Y. Transform of the signal of the system.  Define Y. Transform and De-convolution operation in DSF. Write some applications of convolution and De-convolution operation in DSF. Write some applications of convolution and De-convolution operation in DSF. Write some applications of convolution and De-convolution operation in DSF. Write some applications of convolution and De-convolution operation in DSF. Write some applications of convolution and De-convolution operation operation in DSF. Write some applications of convolution and DSF. Write is one convolution operation by the sequences.  Vital = Linear Convolution and De-convolution operation operation in DSF. Write some applications of digital filter?  Vital = Linear December of the sequences.  Vital = Linear December of the sequences.  Vital do you mean by Machine Vision? Describe the machine vision. In operation by a four sequences of digital image processing. Write down the advantages and disadvantages of digital image processing.  Vital do you mean by Machine Vision? Describe the machine vision and explain infage analysis system and explain infage analysis system and explain infage analysis in the increase and evidence of color recognition? What is kearure extraction? How image can be e	¥ 5	TE 4103	Sic
SECTION-A  What do you know by digiaal signal poor sing? What are the relative advantages and disturbantages of digital signal processing. What do you know by digiaal signal processing over analog signal processing.  Draw the brusis diagram of a typical DSP system. Explain the functions of each block.  Draw the brusis diagram of a typical DSP system. Explain the functions of each block.  y(n) = ½y(n-1) + ½x(n) + ¼x(n-1)  where x(n) is the input and y(n) is the output of the system.  y(n) = ½y(n-1) + ½x(n) + ¼x(n-1)  befine Z Transform. State and explain time reversal property of Z transform.  X(n) = α'u(n) = (ξ'', as'')  State and explain the Linearity and time reversal property of DFT.  Define Z Transform and Do-convolution operation in DSP. Write some applications of enveloped in the Einstein of the signal of the system.  Letters and explain the Linearity and time reversal property of DFT.  Define Z Transform and Do-convolution operation in DSP. Write some applications of enveloped in the Linearity and time reversal property of DFT.  Define Z Transform and Do-convolution operation in DSP. Write some applications of enveloped in the Linearity and time reversal property of DFT.  Define Z Transform and Do-convolution operation of the sequences.  X(n) = (1, 0, 0, 1, -1, 2, -2, 4, 1, -2, 5, 0, 0,)  y(n) = { 0, 0, 1, -1, 2, -2, 4, 1, -2, 5, 0, 0,}  y(n) = { 0, 0, 1, -1, 2, -2, 4, 1, 2, 5, 0, 0,}  y(n) = { 0, 0, 1, -1, 2, -2, 4, 1, 2, 5, 0, 0,}  y(n) = { 0, 0, 1, -1, 2, -2, 4, 1, 2, 5, 0, 0,}  y(n) = { 0, 0, 1, -1, 2, -2, 4, 1, 2, 5, 0, 0,}  y(n) = { 0, 0, 1, -1, 2, -2, 4, 1, 2, 5, 0, 0,}  y(n) = { 0, 0, 1, -1, 2, -2, 4, 1, 2, 5, 0, 0,}  y(n) = { 0, 0, 1, 2, 2, 2, 0, 0,}  y(n) = { 0, 0, 1, 2, 2, 2, 0, 0,}  y(n) = { 0, 0, 1, 2, 2, 2, 0, 0,}  y(n) = { 0, 0, 1, 2, 2, 2, 0, 0,}  y(n) = { 0, 0, 1, 2, 2, 2, 0, 0,}  y(n) = { 0, 0, 1, 2, 2, 2, 2, 2, 0, 0,}  y(n) = { 0, 0, 1, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 0, 0,}  y(n) =	2 = =	Answer any Six questions, taking <b>Three</b> from each section. Figures in the margin indicate full marks.  Use separate answer script for each section.	
What do you know by digital signal processing? What are the retainve advantages and disadvantages of digital signal processing over analog signal processing?  Draw the basis digital signal processing over analog signal processing?  Draw the basis digital signal processing over analog signal processing?  Draw the basis digital signal processing over analog signal processing?  Using basic blocks included by DSP, sketch the block diagram representation of discrete time system described by the input and y(n) is the output of the system. $y(n) = \frac{1}{2}\chi(n-1) + \frac{1}{4}\chi(n-1)$ where $\chi(n)$ is the input and $\chi(n)$ is the output of the system.  Define Z Transform. State and explain time reversal property of Z transform. $\chi(n) = a^{2}\chi(n-1) + \frac{1}{4}\chi(n-1)$ State and explain the Linearity and time reversal property of DFT.  State and explain the Linearity and time reversal property of DFT.  Define Z Transform. State and explain time reversal property of DFT.  State and explain the Linearity and time reversal property of DFT.  State and explain the Linearity and time reversal property of DFT.  State and explain the Linearity and time reversal property of DFT.  State and explain the Linearity and time reversal property of DFT.  To the State and explain the Linearity and time reversal property of DFT.  To the State and explain function functions of the system of the system.  What do you know about digital filtering? What are the upplications of digital filtering? What do you know about digital filtering? What are upplications of digital filtering? What do you meet by Machine Vision? Describe the machine vision. In operation by a four office of the design mathod of Linear places. In Rither using windows method.  What is stance extraction? Hay the down the advantages and disadvantages of digital image processing. Write down the advantages are officed by this denestor? What are image carbaneed? Explain the factors which may can be defined. The factor of Cany Edge derector. What are bringed transformed? Why it is so diffic		SECTION.A	
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where $x(n)$ is the input and $y(n)$ is the output of the system.  Define Z. Transform. State and explain time reversal property of Z transform.  Determine the Z-transform of the signal $x(n) = \alpha^n u(n) = \{0^n, n \in \mathbb{N} \}$ State and explain the Linearity and time reversal property of Z transform. $x(n) = \alpha^n u(n) = \{0^n, n \in \mathbb{N} \}$ State and explain the Linearity and time reversal property of DET.  Define Convolution in DSP.  What is anne correlation function? Discuss the mane convelution function for energy signal and $\alpha$ and $\alpha$ and $\alpha$ are item? Discuss the mane convelution function for energy signal and $\alpha$ and $\alpha$ are item? Discuss the mane convelution function for energy signal and $\alpha$ and $\alpha$ are item.  What do you know about digital filtering? What are the upplications of digital filter?  Define FIR system. Discuss the FIR system for any structure.  What do you mean by Machine Vision? Describe the machine vision, $\alpha$ upstration by a four signal and original filtering? What do you mean by Machine Vision? Describe the machine vision and explain functions of each befine digital image processing. Write down the advantages and disadvantages of digital image processing. Write down the advantages and elicadvantages of digital image are property of a typical image analysis system and explain functions of each block.  What is close the design mathem of a typical image analysis system and explain functions of each block.  What we image transformed Why these transforms are feeded?  What is defined to end of Canny Edge decotor. What advantages are offered by this detector? What we there are no endaged to be considered when cooling image are endaged? What is the latter and issues of object recognition? Why it is so difficult in machine vision tacks?  What is object recognition? Why it is so difficult in anothine vision tacks?  What is object recognition? Why it is so difficult in a considered when cooling in mages are canded? What is object recognition?	30		
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SECTION-B  What do you meet by Machine Vision? Describe the machine vision, in operation by a four such that do you meet by Machine Vision? Describe the machine vision, in operation by a four such than digital image processing.  Mame some image nequisition (vision) sensors. Explain any one type of vision sensor braw in stock diagram of a typical image analysis system and explain functions of each block.  How image can be enhanced? Explain history modeling for image chancement. What are image transforms? Why these transforms are needed?  What is feature extraction? How it is holpful in machine-Vision?  What is chart of Cleany Edge detector. What advantages are offered by this detector? Explain the flow images are ended?  What is object recognition? Why it is so difficult in machine vision tasks?  What is the three main issues of object recognition? Give an example of how object can be walked in meeting the three main issues of object recognition? Give an example of how object can be Wait is meeting the meeting t	TET	What do you know about digital filtering? What are the applications of digital filter?  Define FIR system. Discuss the FIR system for any structure.  Describe the design method of Linear plance FIR filter using windows method.	000
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# Course Registration Form

RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY, BANGLADESH Course Registration/Course Adjustment Form Heaven's Light is Our Guide

Department.	Roll No:	Name:	Academic session with Semester:Previously earned credit:	2
	Roll No:	Name:	Academic session	Course No. of Backlog Courses

Courses to be registered in this semester:

Course No.	Course 11the	Credit
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1 2 2		
	Total credit of this Semester	-

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

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

Students are asked to cross out irrelevant Terms.

MTE 1101: Mechatronic Systems

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#### To Be Continued.....

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