TRAINING PROGRAM REPORT

A FIVE-DAY TRAINING PROGRAM

on

CONTROL SYSTEM SIMULATION- A MATLAB APPROACH

In association with
Internal Quality Assurance Cell (IQAC), KITSW

21 – 25 December, 2020

Dr. G. Rajender Naik
Sri. T. Praveen Kumar
Dr. A. Rajasekhar
Coordinators

Prof. C. Venkatesh
Head, EEED
Convenor

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KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE, WARANGAL - 15

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

No. 98/KITS/EEE/Training | Date: 10.12.2020

Submitted to the Principal

Sub: Five-day training program on "**Control System Simulation - A MATLAB Approach**" from 21.12.2020 to 25.12.2020 - Request to grant permission to conduct in EEE Department for non-teaching staff-Reg.

With reference to the above subject, this is to inform that EEE department is planning to conduct five-day training program on "**Control System Simulation - A MATLAB Approach**" from **21.12.2020 to 25.12.2020** in association with *Internal Quality Assurance Cell (IQAC), KITSW.*

This training program is intended to train the Lab Assistants and instructors of all departments on Control Systems theory and hands on sessions to carry out experiments.

Faculty Coordinators for this workshop are:

1. Dr. G. Rajender Naik, *Associate Professor, EEED*
2. Sri. T. Praveen Kumar, *Assistant Professor, EEED*
3. Dr. A. Rajasekhar, *Assistant Professor, EEED*

Following is the estimated expenditure for conduction of program:

Particular	Amount	Details
Tea & Snacks to the Participants	Rs 4000/-	Rs 5/- per tea and Rs 5/- per snack
Certificate Printing & Banner	Rs 1000/-	Certificate Printing & Banner
Total	Rs 5000/-	

In this regard, it is herewith requested to kindly accord permission to conduct the workshop and sanction an amount of Rs. 5,000/- (Rupees Five thousand only) to meet the expenditure and for smooth conduction of the program.

C. Venkatesh
Head, Department of EEE

Enclosures:

1. Invitation Letter
2. Program Schedule

Submitted to the S&C Sir
Sir, approval may kindly be given for ₹ 5,000/- towards
organising one week Training program to Technical-staff
on "Control System Simulation – A MATLAB Approach"
during 21-25 December, 2020
For approval on para Ⓐ
S&C Sir;
Yes

HoD EEE

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
A Five- Day Training Program on
"Control System Simulation - A MATLAB Approach"
(December 21st to 25th, 2020)
PROGRAM SCHEDULE

Day	9.45am - 11.15am		11.30am-1.00pm		2.00pm-3.15pm		3.30pm-4.45pm
MONDAY 21.12.2020	**9:45 to 10:15** Inaugural Session **10:15 to 11:15 AM** Time response analysis of second order system *Speaker : GRN*	TEA BREAK	Practical session on Time response analysis of second order system *Speaker : GRN/AR*	LUNCH	Time response analysis of second order system using controllers *Speaker : GRN*	TEA BREAK	Practical session on Time response analysis of second order system using controllers *Speaker : GRN/AR*
TUESDAY 22.12.2020	Stability analysis of LTI systems using Root Locus plot *Speaker : TPK*		Stability analysis of LTI systems using Root Locus plot using MATLAB Simulation *Speaker : TPK/AR*		Stability analysis of LTI systems using Bode plot *Speaker : AR*		Stability analysis of LTI systems using Bode plot using MATLAB Simulation *Speaker : AR/GRN*
WEDNESDAY 23.12.2020	Stability analysis of LTI systems using Nyquist plot *Speaker : TPK*		Stability analysis of LTI systems using Nyquist plot using MATLAB Simulation *Speaker : TPK/GRN*		Time response analysis of second order system with and without controller *Speaker : TPK*		Simulation of second order system with and without controller using MATLAB-Simulink *Speaker : TPK/GRN*
THURSDAY 24.12.2020	State Space analysis *Speaker : TPK*		State space modeling using MATLAB *Speaker : TPK/GRN*		Significance of compensators *Speaker : AR*		Practical session on Lead-Lag networks *Speaker : AR/GRN/TPK*
FRIDAY 25.12.2020	Practical session on Synchro Transmitter & Receiver pair *Speaker : AR*		Exam & Valedictory		--		--

GRN – Dr G. Rajender Naik, TPK – Sri T. Praveen Kumar,   AR – Dr A. Rajasekhar

KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE

Warangal – 506 015, Telangana, INDIA *(An AUTONOMOUS INSTITUTE under Kakatiya University, Warangal)*

కాకతీయ సాంకేతిక విజ్ఞాన శాస్త్ర విద్యాలయం. వరంగల్ – ౫౦౬౦౹౫.

Estd-1980 KITSW

INVITATION

The Management, Principal, Faculty and Staff

cordially invite you to the inaugural function of

Five-Day Training Program

On

"Control System Simulation - A MATLAB Approach"

(21st to 25th December 2020)

Organized By

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

in *Association IQAC KITS Warangal*

Capt. V. Lakshmikantha Rao

Member of Parliament (Rajya Saba)
Secretary & Correspondent
Will Preside over the function

Sri P. Narayana Reddy

Treasurer
Will grace the occasion

> **Date: Monday 21st December-2020**
> **Time: 09.45am**
> **Venue: Control Systems Lab, EEED**

Dr. G. Rajender Naik Sri. T. Praveen Kumar Dr. A. Rajasekhar **Coordinators**	Prof. C. Venkatesh **Head, EEED**	Prof. K. Eswaraiah **Coordinator, IQAC**	Prof. K. Ashoka Reddy, **Principal**

Five-Day Training Program

On

"Control System Simulation - A MATLAB Approach"

(21st to 25th December 2020)

Inaugural Function
Agenda

9.45 am   **Welcome Note**

                Report by Faculty Coordinator

                Address by Head of the Department

                Address by IQAC Coordinator

                Address by Principal

                Vote of Thanks

                             Session Follows…..

List of Participants

S.No.	Name of the Participant	Qualification	Designation	Department
1	Sri.P.Sammaiah	ITI	Junior Instructor	EEE
2	Sri M.Sridhar	ITI	Mechanic	EEE
3	Sri B.Kamalakar	Diploma	Lab Assistant	EEE
4	Sri G.Chandra Mouli	M.Tech	Mechanic	EEE
5	Sri M.Vikram	M.Tech	Lab Assistant	EEE
6	Smt. Y.Rekha	Diploma	Lab Assistant	ECE
7	Sri B.Sreehari	Diploma	Lab Assistant	ECE
8	Sri M. Soma Brahma Chary	MCA	Computer Programmer	EIE
9	R. Sandhya Rani	M.Tech	Lab Assistant	EIE
10	P. Suman	B.Tech	Lab Assistant	EIE
11	K. Deepa	B.Tech	Lab Assistant	EIE
12	G. Vinay Kumar	B.Tech	Lab Assistant	ECE
13	M. Prashanth	Diploma	Lab Assistant	ECE

TITLE: Inaugural Function

- Sri. T. Praveen Kumar has invited the Principal and dignitaries to the Training Program.
- Dr. G. Rajender Naik has given Introduction about the Training Program.
- Prof. C. Venkatesh, HoD EEE has mentioned department strengths and Training Program.
- Prof. K. Eswaraiah has given his comments regarding conducting of workshop under Internal Quality Assurance Cell.
- Principal, Professor K. Ashoka Reddy has given speech about the role of non-teaching staff to improve technical skills and knowledge to induct I²RE culture in the Institution.
- Vote of thanks by Dr. A. Rajasekhar.

Photo 1: Principal Prof. K. Ashoka Reddy while giving presidential remarks

Photo 2: Introducing of Participants

Photo 3: Group Photo with Principal, IQAC-Coordinator, HoD-EEE, Coordinators and Participants during Inaugural Function on 21.12.2020

SESSION: 1

TITLE: Time response analysis of second order system

RESOURCE PERSON: Dr. G. Rajender Naik, Associate Professor, EEED, KITS Warangal

REPORT: In this session Dr. G. Rajender Naik, Associate Professor Addressed on the following topics.

➢ Introduction to control systems.

➢ Control systems classification with real time examples.

➢ Description of time response analysis of second order systems.

➢ Discussed the significance of time domain specifications.

➢ Described the time response of second order systems without controllers for various types of damping.

Photo 4: Dr. G. Rajender Naik, KITSW while delivering the Lecture

SESSION: 2

TITLE: Practical session on Time response analysis of second order system

RESOURCE PERSON: Dr. G. Rajender Naik, Associate Professor and Dr. A. Rajasekhar, Assistant Professor, EEED, KITS Warangal

REPORT: In this session Dr. G. Rajender Naik and Dr. A. Rajasekhar delivered the following points during the practical session.

➢ Given the precautions while doing experiment.

➢ Conducted the experiment on the time response of second order systems for various damping factors.

➢ The participants were given exposure on the usage of CRO/DSO for tracking the responses.

➢ Participants were made to conduct similar experiment and to handle the equipment on their own.

➢ After the completion of experiments test was conducted.

Photo 5: Participants observing the responses in DSO while performing the experiment

Five-Day Training Program on
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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
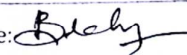in *Association IQAC KITS Warangal*

Session-1: **Time response analysis of second order system**
Name of the Speaker/Expert: Dr G. Rajender Naik
Date & Session Timings: 21.12.2020, 11.30 AM to 1:00 PM

Session Outcome: *After the completion of the session, the participants will be able to obtain the following outcomes*
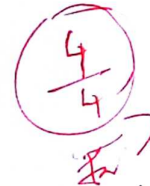
1. Define and classify types of control systems

2. Plot time response of second order systems

Name of the Participant: M. Soma Brahma Chary Signature:

(Please answer the following questions)

Q1. The system with the open loop transfer function $1/s(1+s)$ is:

a) Type 2 and order 1
b) Type 1 and order 1
c) Type 0 and order 0
d) Type 1 and order 2 ✓

Q2. What is steady state response?

It is the response of the System when aproches infinity

Q3. List the time domain specifications.

Rise time
Delay time
Peak time
Peak Overshoot
Setling time

Q4. What will be the nature of response of second order system with different types of damping?

$\xi = 0$ Undamped System
$\xi < 1 \rightarrow$ Under damped system
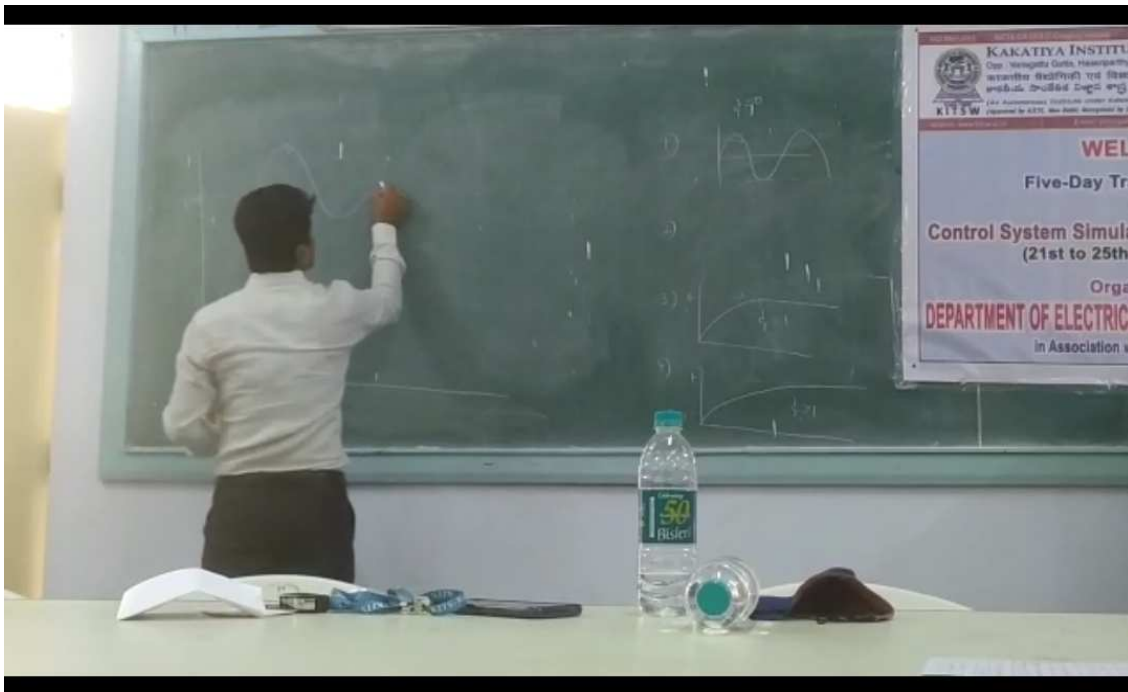$\xi = 1$ Critically damped System
$\xi > 1 \rightarrow$ Over damped System

SESSION: 3

TITLE: Time response analysis of second order system using controllers

RESOURCE PERSON: Dr. G. Rajender Naik, Associate Professor, EEED, KITS Warangal

REPORT: In this session Dr. G. Rajender Naik, Associate Professor Addressed on the following topics.

- In continuation with session-1, the concepts of controllers were introduced to the participants.
- Discussed different types of controllers like P, I, D, PI and PID controllers along with advantages and drawbacks of individual controlling actions.
- The participants were given exposure on the significance of controllers and their respective transfer functions.
- Also, discussed the tuning mechanism of all the conventional controllers and introduced the concepts of modern controllers.

Photo 6: Dr. G. Rajender Naik, KITSW while delivering the Lecture

SESSION: 4

TITLE: Practical session on Time response analysis of second order system using controllers

RESOURCE PERSON: Dr. G. Rajender Naik, Associate Professor and Dr. A. Rajasekhar, Assistant Professor, EEED, KITS Warangal

REPORT: In this session Dr. G. Rajender Naik and Dr. A. Rajasekhar delivered the following points during the practical session.

➢ Given the precautions while doing experiment.

➢ Conducted the experiment on second order study unit with all the controllers discussed in session-3.

➢ The controlling actions of all the controllers were reviewed practically to justify the theoretical concepts discussed in the previous session.

➢ Participants were made to conduct similar experiment and to handle the equipment on their own.

➢ After the completion of experiments test was conducted.

Photo 7: Participants observing the waveforms while doing the experiment

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Session-2: Time response analysis of second order system using controllers
Name of the Speaker/Expert: Dr G. Rajender Naik
Date & Session Timings: 21.12.2020, 2.30 PM to 4:30 PM

> **Session Outcome:** *After the completion of the session, the participants will be able to obtain the following outcomes*
>
> 1. List out P, I, D and PID Controllers
>
> 2. Plot time response of second order systems with P,I,D and PID controllers

Name of the Participant: VIKRAM.M   Signature: M. Vikram

(Please answer the following questions)

Q1. What is the need for a controller?

To minimise time domain specifications.
$(t_d),(t_p)(t_d),(t_s)(M_p)$ and steady state error

Q2. List out the types of controllers in control system.

A) There are Three types of controllers
1) P (proportional) controller   4) PI controller
2) I (Integral) controller   5) PD controller
3) D (Derivative) controller.   6) PID controller

Q3. What is the effect of PI controller on the system performance?

Reduces the steady state error.

Q4. What is the disadvantage in proportional controller?

It increases maximum over shoot

SESSION: 5

TITLE: Stability analysis of LTI systems using Root Locus plot

RESOURCE PERSON: Sri. T. Praveen Kumar, Assistant Professor, EEED, KITS Warangal

REPORT: In this session Sri. T. Praveen Kumar, Assistant Professor Addressed on the following topics.

➢ What is Root locus and the purpose of root locus?

➢ Discussed the rules and procedure for how to draw root locus plot.

➢ Explained how to determine stability of an LTI system using root locus plot with numerical problems.

Photo 8: Sri. T. Praveen Kumar, KITSW while delivering the Lecture

SESSION: 6

TITLE: Stability analysis of LTI systems using Root Locus plot using MATLAB Simulation

RESOURCE PERSON: Sri. T. Praveen Kumar**,** Assistant Professor and Dr. A. Rajasekhar, Assistant Professor, EEED, KITS Warangal

REPORT: In this session Sri. T. Praveen Kumar and Dr. A. Rajasekhar delivered the following points during the practical session.

➢ How to open MATLAB

➢ Explained how to write a program for root locus plot in MATLAB for a given transfer function

➢ Participants simulated the root locus plot for a given transfer function

➢ Participants doubts were clarified for how to determine stability from the plot obtained using MATLAB

➢ After the completion of experiments test was conducted.

Photo 9: Participants performing the experiment to plot root locus using MATLAB

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Session-1: Stability analysis of LTI systems using Root Locus plot
Name of the Speaker/Expert: Sri. T. Praveen Kumar
Date & Session Timings:22.12.2020, FN (9.45am-13.00pm)

Session Outcome: *After the completion of the session, the participants will be able to obtain the following outcomes*

1. *Draw the root locus plot and simulate root locus plot using MATLAB*

2. *Determine stability of an LTI system using root locus.*

Name of the Participant: Kamalakr reddy B   Signature:

(Please answer the following questions)

Q1. Root locus plot is locus of roots of the characteristic equation when the value of variable parameter (K) is varied from ------   Ans: [a]

(a) 0 to ∞

(b) $-\infty$ to ∞

(c) $-\infty$ to 0

(d) None of the above

Q2. The centroid of the transfer function G(s)=K\s(s+2)(s+4) is   Ans: [a]

(a) -2

(b) -4

(c) -3

(d) None of the above

Q3. The command used to simulate root locus plot using MATLAB for a transfer function "h" is   Ans: [a]

(a) rlocus(h)

(b) bode(h)

(c) Nyquist(h)

(d) None of the above

Q4. The angle of asymptote is given by --------------

$$\theta = \frac{(2q+1)\,180}{P-Z}$$

SESSION: 7

TITLE: Stability analysis of LTI systems using Bode plot

RESOURCE PERSON: Dr. A. Rajasekhar, Assistant Professor, EEED, KITS Warangal

REPORT: In this session Dr. A. Rajasekhar, Assistant Professor Addressed on the following topics.

- ➢ Introduction to Frequency Response Analysis
- ➢ Significance and purpose of Bode plot
- ➢ Method and procedure for drawing Bode plot on Semilog Graph Sheets
- ➢ Determination of Gain cross over frequency, phase cross over frequency, Gain Margin and Phase margin from Bode plot.
- ➢ Determination of stability of LTI system using Bode plot with numerical problems.

**Photo 10**: Dr. A. Rajasekhar, KITSW while delivering the Lecture

SESSION: 8

TITLE: Stability analysis of LTI systems using Bode plot using MATLAB Simulation

RESOURCE PERSON: Dr. A. Rajasekhar, Assistant Professor and Dr. G. Rajender Naik, Associate Professor, EEED, KITS Warangal

REPORT: In this session Dr. A. Rajasekhar and Dr. G. Rajender Naik delivered the following points during the practical session.

➢ How to open MATLAB and M-file

➢ Explained how to write a program for Bode plot in MATLAB for a given transfer function

➢ Participants simulated the Bode plot for a given transfer function

➢ Demonstrated the stability using Practical Bode plots obtained in MATLAB.

➢ After the completion of experiments test was conducted.
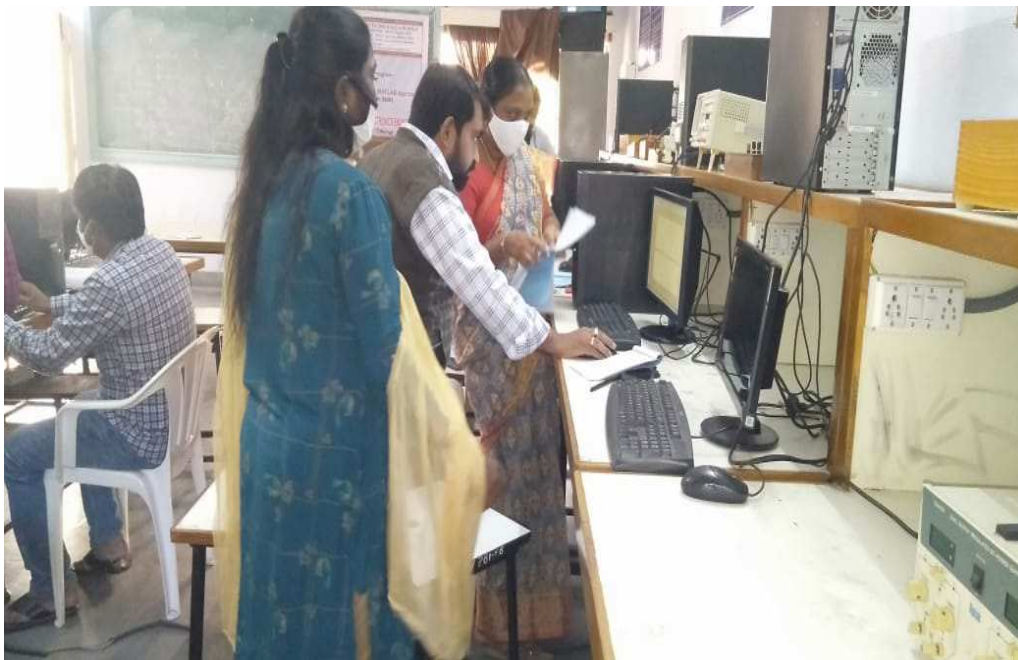
Photo 11: Participants performing the experiment to plot root locus using MATLAB

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Session-4 : Stability analysis of LTI systems using Bode plot

Name of the Speaker/Expert: Dr. A. Rajasekhar

Date & Session Timings: 22/12/2020

Session Outcome: *After the completion of the session, the participants will be able to obtain the following outcomes*

1. *explain the significance of bode plot*

2. *analyse the stability through phase & gain margins using bode plots*

Name of the Participant: M. Sreedhar   Signature:

(Please answer the following questions)

Q1. Bode Plot is a plot relating   [c]

    a) w with Magnitude in dB and Phase angle
    b) w with Magnitude and Phase angle
    c) log w with Magnitude in dB and Phase angle
    d) log w with Magnitude in dB

Q2. When the gain margin is negative and phase margin is negative the system is   [d]

    a) Highly Stable
    b) Oscillatory
    c) Stable
    d) Unstable

Q3. Corner frequency of $1/j\omega T$ is   [C]

    a) Zero
    b) Unity
    c) 1/T
    d) T

Q4. The main advantage(s) of bode plot is /are   [d]

    a) Easy and quick construction in comparison with other frequency plots
    b) Direct interpolation of experimental data
    c) Quick demonstration of relative stability of a closed loop control system
    d) All the above

SESSION: 9

TITLE: Stability analysis of LTI systems using Nyquist plot

RESOURCE PERSON: Sri. T. Praveen Kumar, Assistant Professor, EEED, KITS Warangal

REPORT: In this session Sri. T. Praveen Kumar, Assistant Professor Addressed on the following topics.

- ➢ What is the purpose of Nyquist plot?
- ➢ Discussed the procedure to draw Nyquist plot.
- ➢ Explained how to determine stability of a closed loop control system using Nyquist plot.
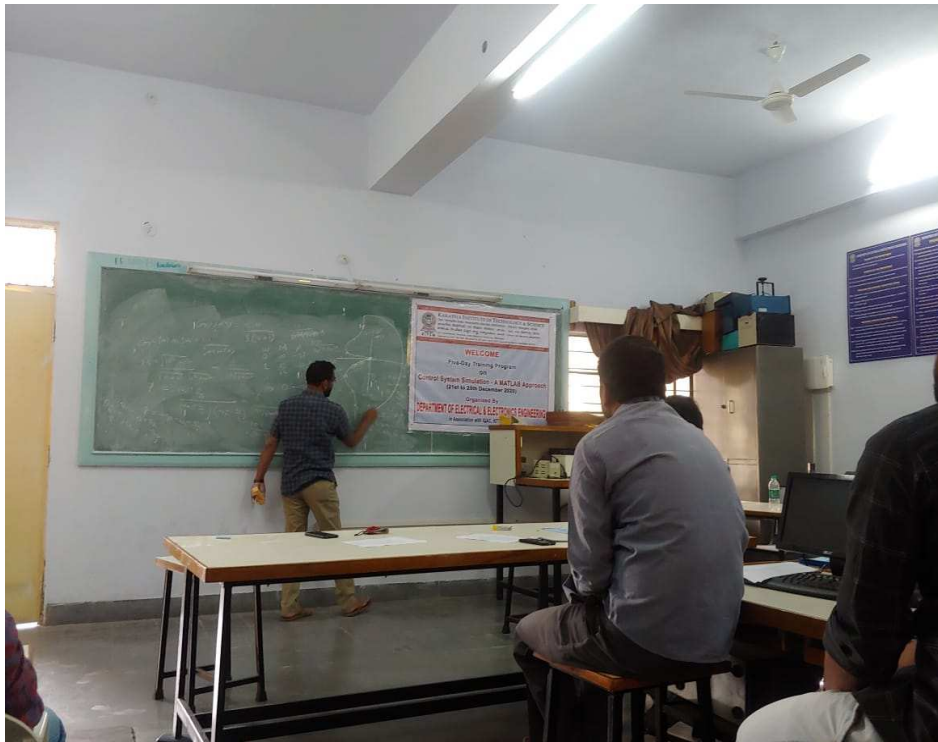
Photo 12: Sri. T. Praveen Kumar, KITSW while delivering the Lecture

SESSION: 10

TITLE: Stability analysis of LTI systems using Nyquist plot using MATLAB Simulation

RESOURCE PERSON: Sri. T. Praveen Kumar**,** Assistant Professor and Dr. G. Rajender Naik, Associate Professor, EEED, KITS Warangal

REPORT: In this session Sri. T. Praveen Kumar and Dr. G. Rajender Naik delivered the following points during the practical session.

- ➢ How to open MATLAB and M-file
- ➢ Explained how to write a program for Nyquist plot in MATLAB for a given transfer function
- ➢ Participants simulated the Nyquist plot for a given transfer function
- ➢ After the completion of experiments test was conducted.
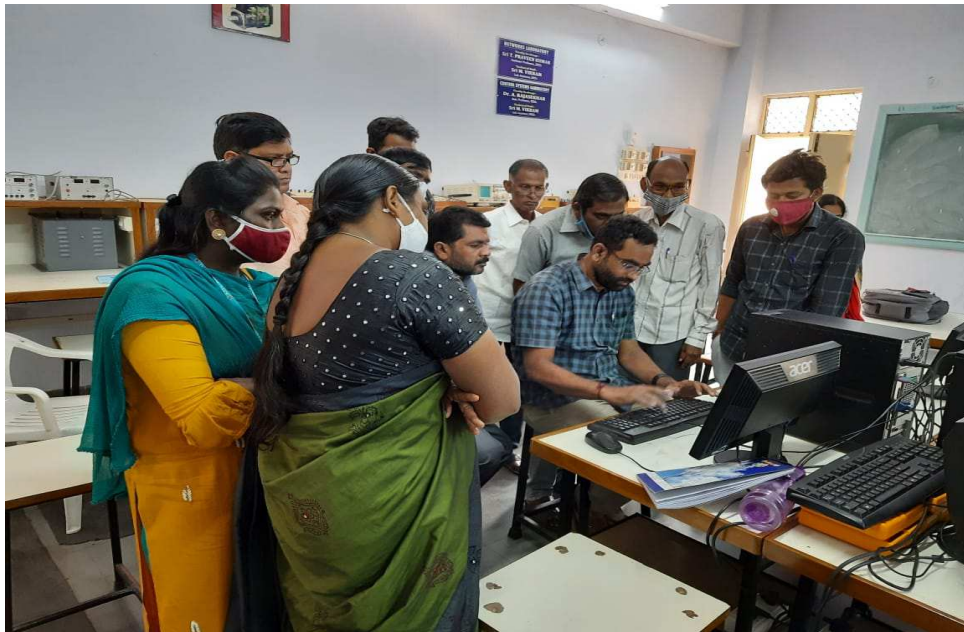
Photo 13: Participants listening to the speaker while explaining how to write a program for Nyquist plot in MATLAB

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Session-1: Stability analysis of LTI systems using Nyquist plot
Name of the Speaker/Expert: Sri. T. Praveen Kumar
Date & Session Timings:23.12.2020, FN (9.45am-13.00pm)

> **Session Outcome:** *After the completion of the session, the participants will be able to*
>
> *1. Draw the Nyquist plot and simulate Nyquist plot using MATLAB*
>
> *2.Determine stability of an LTI system using Nyquist Plot.*

Name of the Participant: B. Kamalakar Ley   Signature:

(Please answer the following questions)

Q1. Nyquist plot is a   Ans: [b]
   (a) Time response plot
   (b) Frequency response plot
   (c) Can't say
   (d) None of the above

Q2. Nyquist plot is used to determine -----------

Nyquist plot is used to determine " System stability'.

Q3. The command used to simulate Nyquist plot using MATLAB for a transfer function "h" is   Ans: [b]
   (a) rlocus(h)
   (b) Nyquist(h)
   (c) bode(h)
   (d) None of the above

Q4. The Nyquist plot of open loop transfer function G(s)H(s) is shown in figure below. If G(s)H(s) has one right hand pole then the closed loop system is stable [b]

   (a) Unstable (b) stable (c) can't say (d)None of the above
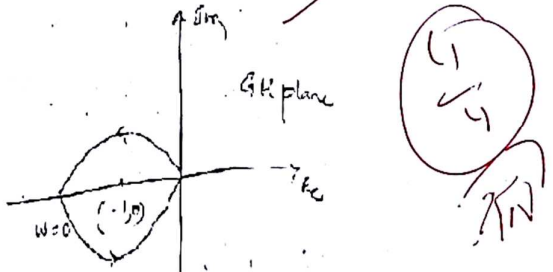
SESSION: 11

TITLE: Time response analysis of second order system with and without controller

RESOURCE PERSON: Sri. T. Praveen Kumar, Assistant Professor, EEED, KITS Warangal

REPORT: In this session Sri. T. Praveen Kumar, Assistant Professor Addressed on the following topics.

> ➢ Types of controllers and importance of controllers.
> ➢ Advantages and disadvantages of P, PI, PD & PID Controllers.
> ➢ Time response of an LTI system with and without controllers.
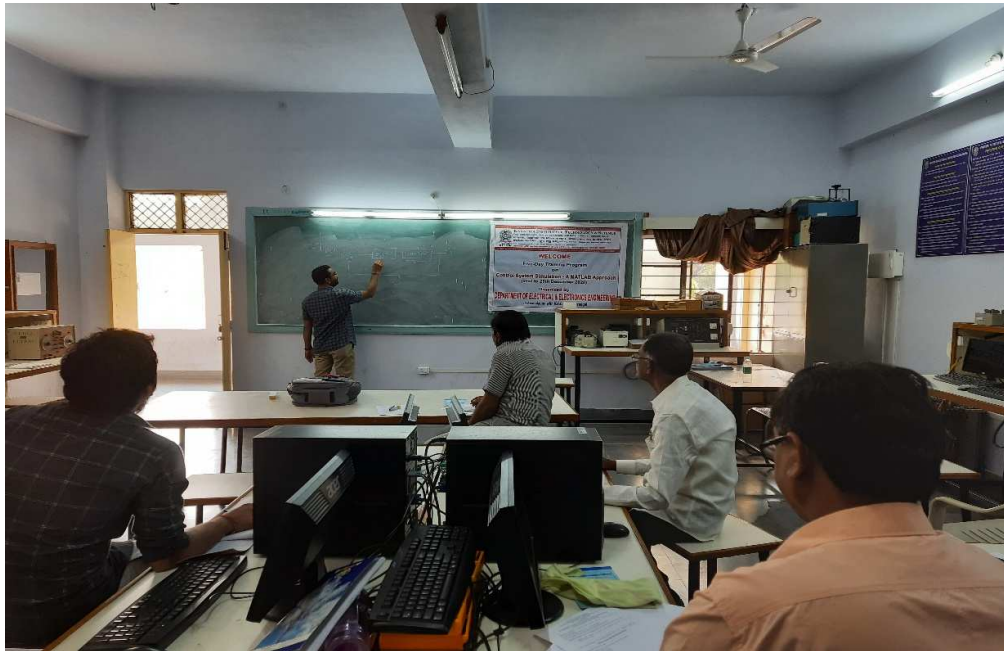
Photo 14: Sri. T. Praveen Kumar, KITSW while delivering the Lecture

SESSION: 12

TITLE: Simulation of second order system with and without controller using MATLAB-Simulink

RESOURCE PERSON: Sri. T. Praveen Kumar**,** Assistant Professor and Dr. G. Rajender Naik, Associate Professor, EEED, KITS Warangal

REPORT: In this session Sri. T. Praveen Kumar and Dr. G. Rajender Naik delivered the following points during the practical session.

- How to open MATLAB/SIMULINK model
- Explained how to build a Simulink model using MATLAB for a given second order system with and without controller
- Participants simulated the response of a given second order system with and without controller and analysed the response
- After the completion of experiments test was conducted.
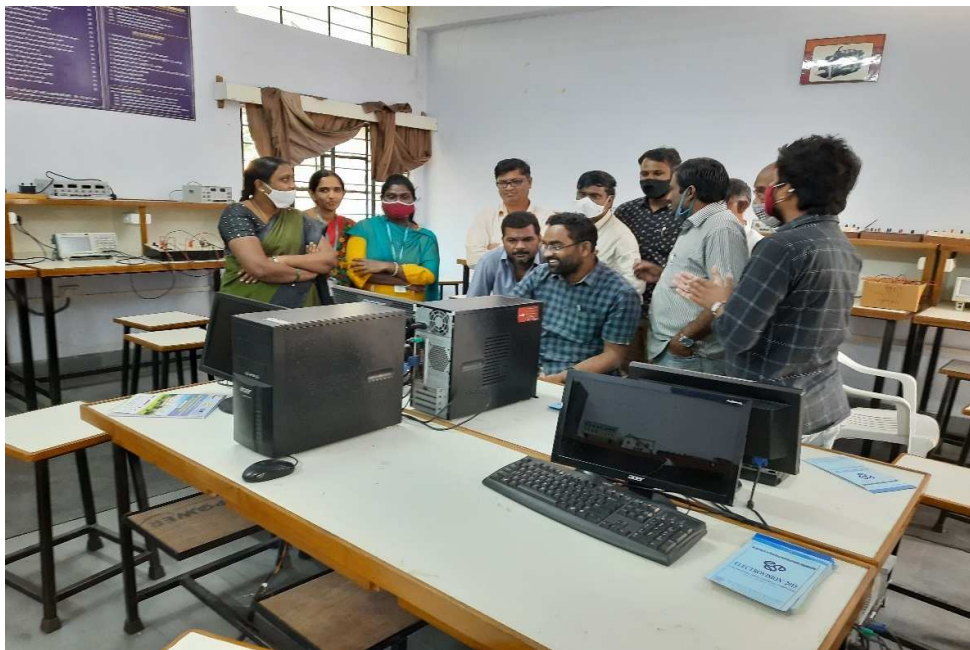
Photo 15: Participants observing the simulated response while performing the experiment

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Session-2: Simulation of second order system with and without controller using MATLAB/Simulink

Name of the Speaker/Expert: Sri. T. Praveen Kumar

Date & Session Timings: 23.12.2020, AN (2.00 PM to 4:30 PM)

Session Outcome: *After the completion of the session, the participants will be able to*

- *Simulate time response of second order systems with PID controller using MATLAB/SIMULINK*

Name of the Participant: Y. Rekha   Signature:

(Please answer the following questions)

Q1. The PID Controller adds

(a) a pole at origin and two finite zeros in the system
(b) a pole in the system
(c) a zero in the system
(d) None of the above

Q2. The PI controller

(a) Reduces steady state error
(b) Improves stability
(c) Both a & b
(d) None of the above

Q3. The PD controller improves

(a) Improves stability
(b) Reduces rise time
(c) Both a & b
(d) None of the above

Q4. The Proportional controller improves

(a) Transient performance
(b) Steady state performance
(c) Both a & b
(d) None of the above

SESSION: 13

TITLE: State Space analysis

RESOURCE PERSON: Sri. T. Praveen Kumar, Assistant Professor, EEED, KITS Warangal

REPORT: In this session Sri. T. Praveen Kumar, Assistant Professor Addressed on the following topics.

- ➢ Definitions of state space, controllability and observability.
- ➢ How to write a state model for a differential equation and transfer function
- ➢ Test for controllability and observability for a given state model
- ➢ Problems on controllability and observability
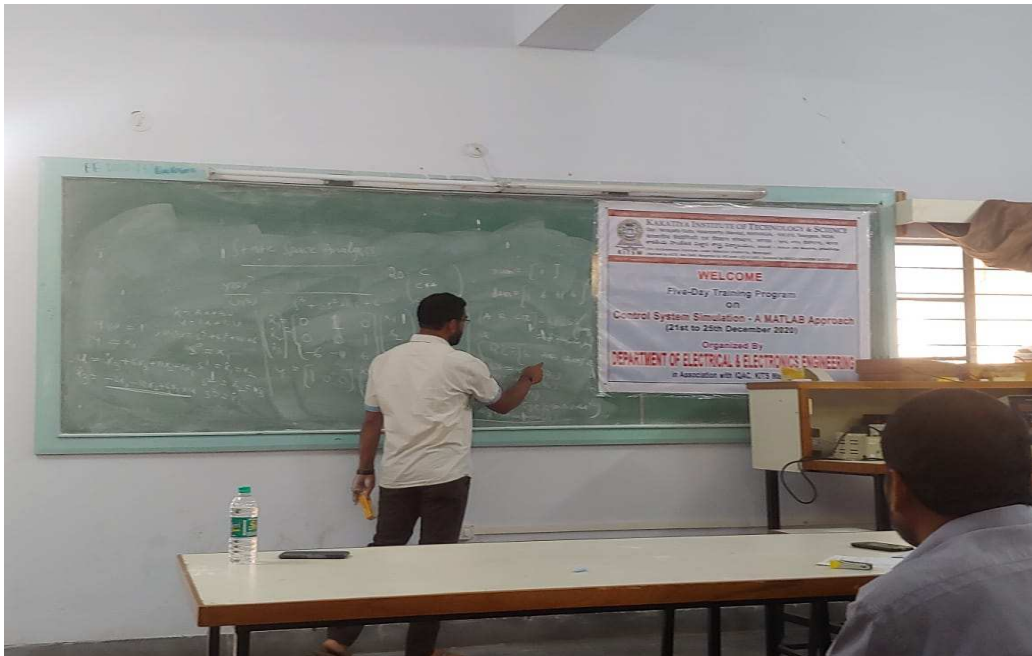
Photo 16: Sri. T. Praveen Kumar, KITSW while delivering the Lecture

SESSION: 14

TITLE: State space modeling using MATLAB

RESOURCE PERSON: Sri. T. Praveen Kumar**,** Assistant Professor and Dr. G. Rajender Naik, Associate Professor, EEED, KITS Warangal

REPORT: In this session Sri. T. Praveen Kumar and Dr. G. Rajender Naik delivered the following points during the practical session.

➢ How to open MATLAB.

➢ Explained how to write a program for controllability and observability for a given transfer function or state model.

➢ Participants simulated for controllability and observability for a given transfer function or state model.

➢ After the completion of experiments test was conducted.
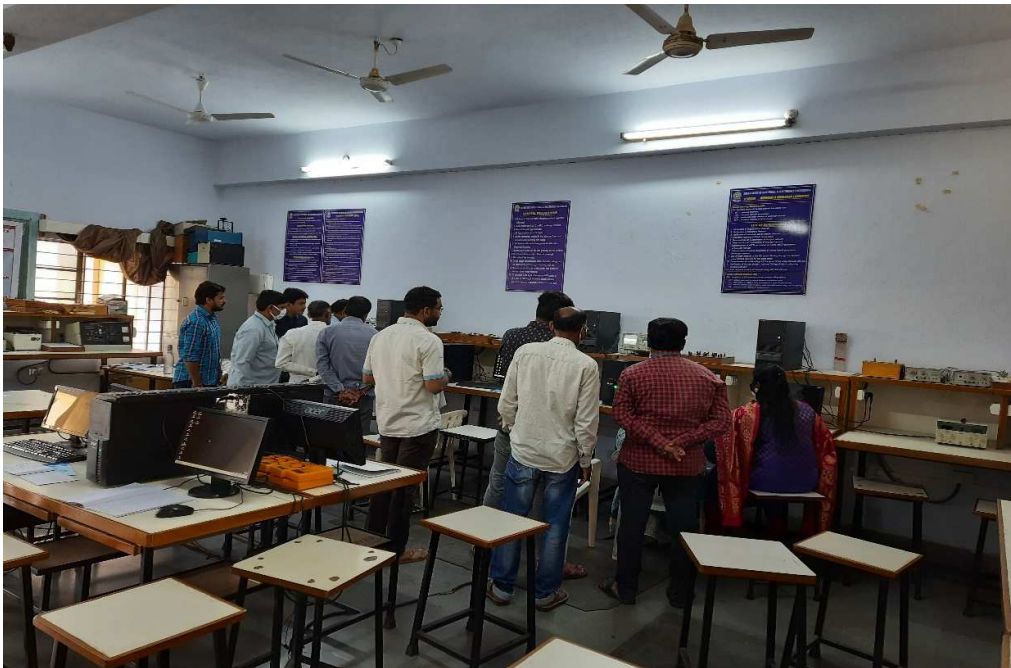
Photo 17: Participants performing experiment to determine controllability & observability of a state model

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in *Association IQAC KITS Warangal*

Session-1: State Space analysis
Name of the Speaker/Expert: Sri. T. Praveen Kumar
Date & Session Timings:24.12.2020, FN (9.45am-13.00pm)

> **Session Outcome**: *After the completion of the session, the participants will be able to*
>
> - *Determine the controllability and observability of a system using state space analysis*

Name of the Participant: M. Soma Bichus Chary   Signature: Bichy

(Please answer the following questions)

Q1. A System is said to be controllable if   Ans:[B]
  - (a) Determinant of Qc=0
  - (b) Determinant of Qc≠0
  - (c) Determinant of Qo=0
  - (d) Determinant of Qo≠0

Q2. A System is said to be observable if   Ans: [D]
]
  - (a) Determinant of Qc=0
  - (b) Determinant of Qc≠0
  - (c) Determinant of Qo=0
  - (d) Determinant of Qo≠0

Q3. The controllable matrix Qc is given by Qc=[B AB A²B....Aⁿ⁻¹B]   True/False   [True]

Q4. The state model given below is   Ans[D]
  - (a) controllable
  - (b) observable
  - (c) both a & b
  - (d) not controllable and not observable

$$\dot{x} = \begin{bmatrix} 2 & 0 \\ -1 & 1 \end{bmatrix}\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 7 \\ 1 \end{bmatrix}u$$

4/4

SESSION: 15

TITLE: Significance of Compensators

RESOURCE PERSON: Dr. A. Rajasekhar, Assistant Professor, EEED, KITS Warangal

REPORT: In this session Dr. A. Rajasekhar, Assistant Professor Addressed on the following topics.

 ➢ Significance of Compensation and role of compensator in Feedback Control systems.
 ➢ Different types Compensation Schemes.
 ➢ Different types of Compensation techniques (viz. Phase Lag, Phase Lead and Phase Lag-Lead) with circuit diagrams.
 ➢ Advantages and disadvantages of the compensation techniques were discussed.
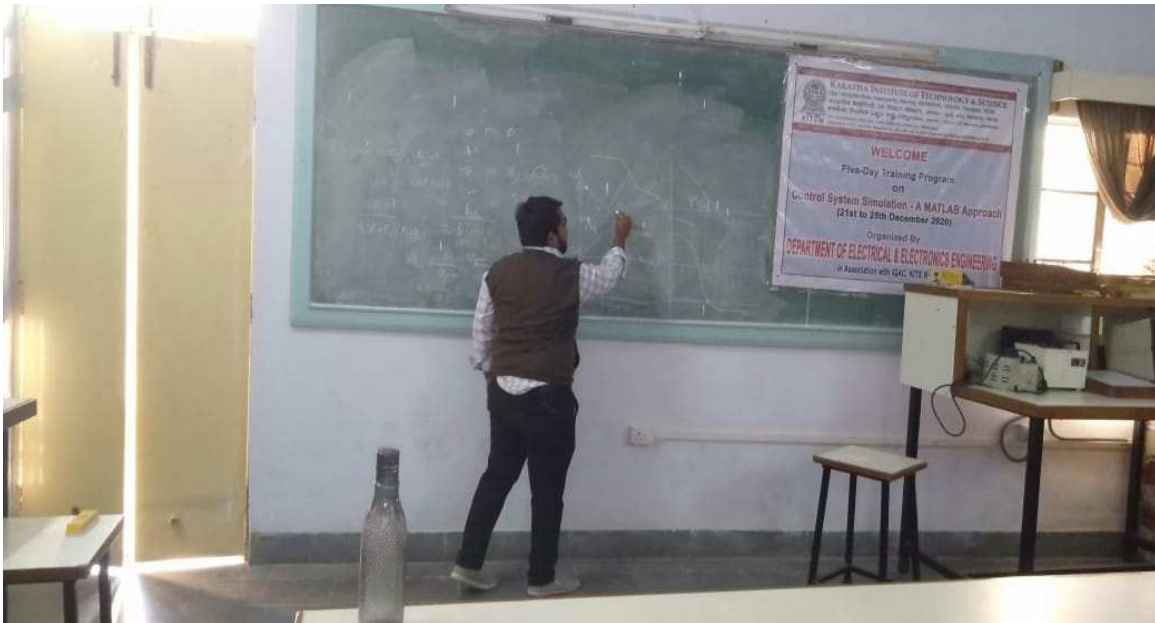
Photo 18: Dr. A. Rajasekhar, KITSW while delivering the Lecture

SESSION: 16

TITLE: Practical session on Lead-Lag networks

RESOURCE PERSON: Dr. A. Rajasekhar**,** Assistant Professor, Sri. T. Praveen Kumar, Assistant Professor and Dr. G. Rajender Naik, Associate Professor, EEED, KITS Warangal

REPORT: In this session Dr. A. Rajasekhar, Sri. T. Praveen Kumar and Dr. G. Rajender Naik delivered the following points during the practical session.

- ➢ Given the precautions while doing experiment.
- ➢ As discussed in Session-15, Conducted the experiment on the Lead-Lag Network study unit.
- ➢ Participants were given exposure to make the networks connections depending on lag, lead and lead-lag networks and how generate input sinewave signal.
- ➢ Demonstrated, how to vary the frequency and how to measure the phase angle difference and magnitude for different frequencies.
- ➢ Participants were trained to conduct similar experiment and to handle the equipment on their own.
- ➢ After the completion of experiments test was conducted.
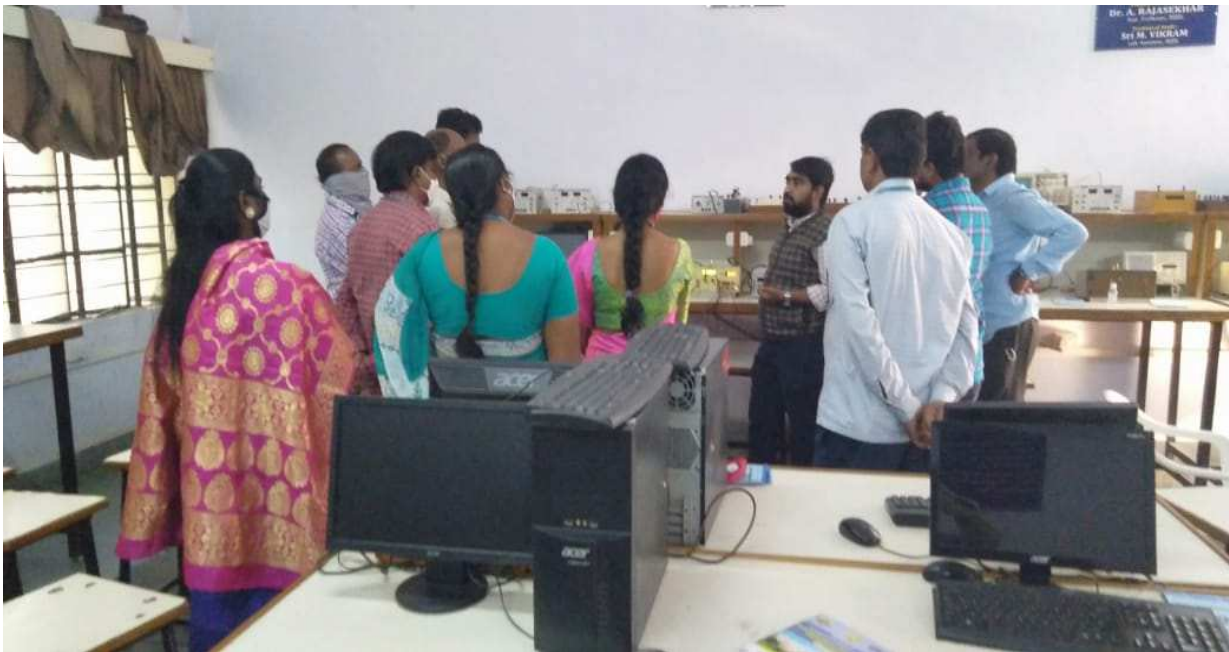
Photo 19: Participants listening to the speaker while explaining Compensation with Lead-Lag Compensation Study Unit

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Session-15 &16 : Significance of Compensators

Name of the Speaker/Expert: Dr. A. Rajasekhar

Date & Session Timings: 24/12/2020 & 2.00pm-4.45pm

> **Session Outcome:** *After the completion of the session, the participants will be able to obtain the following outcomes*
>
> 1. *Understand the need for Compensation*
>
> 2. *analyse the significance of Lag, Lead and Lag-Lead Compensation techniques*

Name of the Participant: M. SRIDHAR   Signature:

(Please answer the following questions)

Q1. Lead Compensator network is   [b]

   a) Equalizer
   b) High-pass filter
   c) Low pass filter
   d) None of the above

Q2. A lag compensation network normally consists of   [c]

   a) R and L elements
   b) L and C elements
   c) R and C elements
   d) R, L and C elements

Q3. Phase _____ Compensator increases the Bandwidth most   [b]

   a) Lag
   b) Lead
   c) Lag-Lead
   d) None of the above

Q4. A phase lag-lead network introduces in the output   [b]

   a) Lag at all frequencies and lead at low frequencies
   b) Lead at high frequencies and lag at low frequencies
   c) Lag at all frequencies
   d) Lead at all frequencies

SESSION: 17

TITLE: Practical session on Synchro Transmitter & Receiver pair

RESOURCE PERSON: Dr. A. Rajasekhar, Assistant Professor, EEED, KITS Warangal

REPORT: In this session Dr. A. Rajasekhar, Assistant Professor Addressed on the following topics.

➢ Given the precautions while doing experiment.

➢ Given the circuit description and working principle of Synchro.

➢ Demonstrated how the Rotor angular position changes with the change in Stator angular position with the help of hardware set up.

➢ Discussed the importance and applications of Synchro **Transmitter & Receiver pair.**

➢ After the completion of experiments test was conducted.

Photo 20: Participants listening to the speaker while explaining the how Rotor angular position varies with change in Stator angular position

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Session-17 : Synchro Transmitter & Receiver pair

Name of the Speaker/Expert: Dr. A. Rajasekhar

Date & Session Timings: 25/12/2020 & 10.15 am-11.15 am

Session Outcome: *After the completion of the session, the participants will be able to obtain the following outcomes*

1. *Significance of Synchro*

2. *Operating Principle & Applications*

Name of the Participant: M. SRIDHAR   Signature:

(Please answer the following questions)

Q1. Synchro is a/an   [d]

  a) Frequency transformer
  b) Electronic rectifier
  c) Electro-magnetic transducer
  d) Electro-mechanical device

Q2. Synchro resembles ____ in construction   [a]

  a) Induction Motor
  b) Universal motor
  c) DC Motor
  d) Transformer

Q3. Synchro Transmitter also acts as   [b]

  a) Comparator
  b) Error Detector
  c) Compensator
  d) None

Q4. Write the different trade names of Synchro

Syslin, Autosin, Telesin

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Warangal – 506 015, Telangana, INDIA *(An AUTONOMOUS INSTITUTE under Kakatiya University, Warangal)*

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K I T S W

<u>INVITATION</u>

The Management, Principal, Faculty and Staff

Cordially invite you to the **Valedictory function** of

Five-Day Training Program

On

"Control System Simulation - A MATLAB Approach"

(21st to 25th December 2020)

Organized By

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

in *Association IQAC KITS Warangal*

Capt. V. Lakshmikantha Rao

Member of Parliament (Rajya Saba)
Secretary & Correspondent
Will Preside over the function

Sri P. Narayana Reddy

Treasurer
Will grace the occasion

Date: Monday 25th December-2020
Time: 04.00pm
Venue: Control Systems Lab, EEED

Dr. G. Rajender Naik	Prof. C. Venkatesh	Prof. K. Eswaraiah	Prof. K. Ashoka Reddy
Sri. T. Praveen Kumar	**Head, EEED**	**Coordinator, IQAC**	**Principal**
Dr. A. Rajashekar		**KITSW**	
Coordinators			

Five-Day Training Program

On

"Control System Simulation - A MATLAB Approach"

(21st to 25th December 2020)

Valedictory Function
Agenda

04.00 pm   Welcome

Report by Faculty Coordinator

Address by Head of the Department

Address by IQAC Coordinator

Address by Principal

Certificate Distribution

Vote of Thanks

Photo 21: Sri T. Praveen Kumar Welcoming Honourable Principal Dr. K. Ashoka Reddy and HOD, EEE, Dr. C. Venkatesh and Participants to Valedictory Function

Photo 22: Dr. G. Rajender Naik giving brief report on Five-day Training Program

Photo 23: Participant B. Kamalakar giving feedback on Training Program

Photo 24: Participant Y. Rekha giving feedback on Training Program

Certificate distribution during Valedictory Function of FDP, 25st Dec. 2020

Presenting appreciation certificate to Dr. G. Rajender Naik

Presenting appreciation certificate to Sri. T. Praveen Kumar

Presenting appreciation certificate to Dr. A. Rajasekhar

Vote of thanks by Dr. A. Rajasekhar

Certificates of Participants

KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE
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PARTICIPATION CERTIFICATE

No: KITSW-EEED-CSSMA01

This is to certify that *Sri P. Sammaiah* working as *Junior Instructor* in the department of *EEE* at *Kakatiya Institute of Technology & Science, Warangal* has actively participated in Five-Day Training Program on *"Control System Simulation - A MATLAB Approach (CSSMA)"* organized by Department of Electrical & Electronics Engineering in association with *IQAC KITS Warangal* held during *21-25 December, 2020.*

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No: KITSW-EEED-CSSMA05

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No: KITSW-EEED-CSSMA02

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No: KITSW-EEED-CSSMA06

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No: KITSW-EEED-CSSMA03

This is to certify that *Sri B. Kamalakar* working as *Lab Assistant* in the department of *EEE* at *Kakatiya Institute of Technology & Science, Warangal* has actively participated in Five-Day Training Program on *"Control System Simulation - A MATLAB Approach (CSSMA)"* organized by Department of Electrical & Electronics Engineering in association with *IQAC KITS Warangal* held during *21-25 December, 2020.*

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No: KITSW-EEED-CSSMA07

This is to certify that *Sri B. Sreehari* working as *Lab Assistant* in the department of *ECE* at *Kakatiya Institute of Technology & Science, Warangal* has actively participated in Five-Day Training Program on *"Control System Simulation - A MATLAB Approach (CSSMA)"* organized by Department of Electrical & Electronics Engineering in association with *IQAC KITS Warangal* held during *21-25 December, 2020.*

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No: KITSW-EEED-CSSMA04

This is to certify that *Sri G. Chandra Mouli* working as *Mechanic* in the department of *EEE* at *Kakatiya Institute of Technology & Science, Warangal* has actively participated in Five-Day Training Program on *"Control System Simulation - A MATLAB Approach (CSSMA)"* organized by Department of Electrical & Electronics Engineering in association with *IQAC KITS Warangal* held during *21-25 December, 2020.*

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No: KITSW-EEED-CSSMA08

This is to certify that *Sri M. Soma Brahma Chary* working as *Computer Programmer* in the department of *E&IE* at *Kakatiya Institute of Technology & Science, Warangal* has actively participated in Five-Day Training Program on *"Control System Simulation - A MATLAB Approach (CSSMA)"* organized by Department of Electrical & Electronics Engineering in association with *IQAC KITS Warangal* held during *21-25 December, 2020.*

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No: KITSW-EEED-CSSMA09

This is to certify that **Smt R. Sandhya Rani** working as **Lab Assistant** in the department of **E&IE** at **Kakatiya Institute of Technology & Science, Warangal** has actively participated in Five-Day Training Program on **"Control System Simulation - A MATLAB Approach (CSSMA)"** organized by Department of Electrical & Electronics Engineering in association with **IQAC KITS Warangal** held during **21-25 December, 2020.**

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No: KITSW-EEED-CSSMA11

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No: KITSW-EEED-CSSMA13

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Assoc. Prof, EEED
KITSW

Sri. T. Praveen Kumar
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Asst. Prof, EEED
KITSW

Dr. A. Rajasekhar
Coordinator, CSSMA
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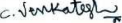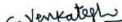
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Prof. C. Venkatesh
Professor & HoD, EEED, KITSW

Prof. K. Eswaraiah
Coordinator, IQAC KITSW

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This is to certify that **Sri T. Praveen Kumar** working as **Assistant Professor** in the department of **EEE** at **Kakatiya Institute of Technology & Science, Warangal** has acted as **Coordinator** for Five-Day Training Program on *"Control System Simulation - A MATLAB Approach (CSSMA)"* organized by Department of Electrical & Electronics Engineering in association with **Internal Quality Assurance Cell (IQAC), KITS-Warangal** held during **21 to 25 December, 2020.**

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No: KITSW-EEED-CSSMA-RP02

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Prof. C. Venkatesh
Professor & HoD, EEED, KITSW

Prof. K. Eswaraiah
Coordinator, IQAC KITSW

Prof. K. Ashoka Reddy
Principal, KITSW

Feedback Form

PARTICIPANT FEEDBACK FORM

A Five-Day Training Program On "Control System Simulation - A MATLAB Approach"
(21st to 25th December 2020) in Association with Internal Quality Assurance Cell (IQAC), KITSW

Participant Details

Name: **M. PRASHANTH**

Position: **Lab Assistant**

Mobile Number: **9491027433**

E. mail: **prashanthomula109@gmail.com**

Please rate each of the following categories

Session	Date & Time	Topic	Speaker/ Trainer	Feedback				
				1	2	3	4	5
I.	21.12.2020 10.15am-11.15am	Time response analysis of second order system	Dr. G. Rajender Naik, Associate. Prof., KITSW					✓
II.	21.12.2020 11.30am-1.00pm	Practical session on Time response analysis of second order system	Dr. G. Rajender Naik, Associate. Prof., KITSW & Dr. A. Rajasekhar, Assistant. Prof., KITSW					✓
III.	21.12.2020 2.00pm-3.15pm	Time response analysis of second order system using controllers	Dr. G. Rajender Naik, Associate. Prof., KITSW					✓
IV.	21.12.2020 3.30pm-4.45pm	Practical session on Time response analysis of second order system using controllers	Dr. G. Rajender Naik, Associate. Prof., KITSW & Dr. A. Rajasekhar, Assistant. Prof., KITSW					✓
V.	22.12.2020 10.15am-11.15am	Stability analysis of LTI systems using Root Locus plot	Sri. T. Praveen Kumar, Assistant. Prof., KITSW					✓
VI.	22.12.2020 11.30am-1.00pm	Stability analysis of LTI systems using Root Locus plot using MATLAB Simulation	Sri. T. Praveen Kumar, Assistant. Prof., KITSW & Dr. A. Rajasekhar, Assistant. Prof., KITSW					✓
VII.	22.12.2020 2.00pm-3.15pm	Stability analysis of LTI systems using Bode plot	Dr. A. Rajasekhar, Assistant. Prof., KITSW					✓
VIII.	22.12.2020 3.30pm-4.45pm	Stability analysis of LTI systems using Bode plot using MATLAB Simulation	Dr. A. Rajasekhar, Assistant. Prof., KITSW & Dr. G. Rajender Naik, Associate. Prof., KITSW					✓
IX.	23.12.2020 10.15am-11.15am	Stability analysis of LTI systems using Nyquist Plot	Sri. T. Praveen Kumar, Assistant. Prof., KITSW					✓
X.	23.12.2020 11.30am-1.00pm	Stability analysis of LTI systems using Nyquist plot using MATLAB Simulation	Sri. T. Praveen Kumar, Assistant. Prof., KITSW & Dr. G. Rajender Naik, Associate. Prof., KITSW					✓

XI.	23.12.2020 2.00pm-3.15pm	Time response analysis of second order system with and without controller	Sri. T. Praveen Kumar, Assistant. Prof., KITSW						✓
XII.	23.12.2020 3.30pm-4.45pm	Simulation of second order system with and without controller using MATLAB-Simulink	Sri. T. Praveen Kumar, Assistant. Prof., KITSW & Dr. G. Rajender Naik, Associate. Prof., KITSW						✓
XIII.	24.12.2020 10.15am-11.15am	State Space analysis	Sri. T. Praveen Kumar, Assistant. Prof., KITSW						✓
XIV.	24.12.2020 11.30am-1.00pm	State space modeling using MATLAB	Sri. T. Praveen Kumar, Assistant. Prof., KITSW & Dr. G. Rajender Naik, Associate. Prof., KITSW						✓
XV.	24.12.2020 2.00pm-3.15pm	Significance of Compensators	Dr. A. Rajasekhar, Assistant. Prof., KITSW						✓
XVI.	24.12.2020 3.30pm-4.45pm	Practical session on Lead-Lag networks	Dr. A. Rajasekhar, Assistant. Prof., KITSW & Dr. G. Rajender Naik, Associate. Prof., KITSW & Sri. T. Praveen Kumar, Assistant. Prof., KITSW						✓
XVII.	25.12.2020 10.15am-11.15am	Practical session on Synchro Transmitter & Receiver pair	Dr. A. Rajasekhar, Assistant. Prof., KITSW						✓

Please rate in each of the following categories

S.No	Particulars	Feedback				
		1	2	3	4	5
1.	How do you feel about the technical information?					✓
2.	How do you feel about the practical sessions?					✓
3.	Whether the sessions were conducted in time?					✓
4.	Give rating on hospitality					✓
5.	How do you rate the Training program in overall?					✓

Are you interested for other workshops from the department?   Yes/ No

Any other suggestion/ information

Please provide material sir
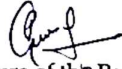
Signature of Participant

Registration Form

<u>Registration Form</u>

Name of theParticipant: P. Samaiah

Designation: Jr. Instructor

Department: EEE

Organization: KITS W

Correspondence Address B.III

District: warangal

PIN code: 506371

Mobile Number: 9502265046

Email:

Signature of the Participant

Date: 15-12-2020
Place: Warangal.

C. Venkatesh
15/12/20
Signature of Head of the Department/Sponsoring Authority
(With Date & Seal)

Last date of Registration 15.12.2020

Attendance Sheet

ATTENDANCE SHEET

S.No.	Name of the Participant	21.12.2020 FN	21.12.2020 AN	22.12.2020 FN	22.12.2020 AN	23.12.2020 FN	23.12.2020 AN	24.12.2020 FN	24.12.2020 AN	25.12.2020 FN
1	Sri.P.Sammaiah									
2	Sri M.Sridhar									
3	Sri B.Kamalakar									
4	Sri G.Chandra Mouli									
5	Sri M.Vikram									
6	Smt. Y.Rekha									
7	Sri B.Sreehari									
8	Sri Brahma Chary M.S.									
9	R. Sandhya Rani									
10	P. Suman									
11	K. Deepa									
12	G. Vinay Kumar									
13	M. Prashanth									

Media Coverage on Training Program

ఉమ్మడి వరంగల్ జిల్లా

ప్రయోగాత్మక విద్యతోనే మెరుగైన ఫలితాలు

● కిట్స్ కళాశాల ప్రిన్సిపాల్
డాక్టర్ కె.అశోక్‌రెడ్డి

నవతెలంగాణ–హసన్‌పర్తి

ఇంజనీరింగ్ విద్యార్థులు ప్రయోగాత్మక విద్యతోనే మెరుగైన ఫలితాలు సాధించవచ్చని ప్రిన్సిపాల్ డాక్టర్ కె.అశోక్‌రెడ్డి అన్నారు. మండలంలోని ఎర్రగ ట్టుగుట్ట క్రాసురోడ్డు కిట్స్ ఇంజనీరింగ్ కళాశాలలో ఎలక్ట్రికల్ అండ్ ఎలక్ట్రానిక్స్ ఇంజనీరింగ్ విభాగం ఆధ్వర్యంలో కంట్రోల్ సిస్టమ్ సిమ్యులేషన్–ఎ మ్యాట్‌ల్యాబ్ అప్రోచ్ అనే సాఫ్ట్‌వేర్ అంశంపై ఎదురోజుల శిక్షణ కార్యక్రమం మంగళవారం రెండవ రోజు జరిగింది. ఈ సందర్భంగా కళాశాల ప్రిన్సిపాల్ డాక్టర్ కె.అశోక్‌రెడ్డి

సదస్సునుద్దేశించి మాట్లాడారు. ల్యాబ్ అసిస్టెంట్లు, ల్యాబ్ బోధకులకు కంట్రోల్ సిస్టమ్ లాబోరేటరికి అందుబాటులో ఉన్న ఆధునిక సాంకేతిక సాధనాలు, సాఫ్ట్‌వేర్‌ల గురించి తెలుసుకోవడం ఈ హ్యాండ్స్ ఆన్

శిక్షణ యొక్క ముఖ్య ఉద్దేశ్యమన్నారు. ఈ సందర్భంగా ఎలక్ట్రికల్ అండ్ ఎలక్ట్రానిక్స్ ఇంజనీరింగ్ విభాగం ట్రిపుల్ఈ విభాగాధిపతులను రాజ్యసభసభ్యుడు, కిట్స్ కార్యదర్శి, కరస్పాండెంట్ కెప్టెన్ వి.లక్ష్మీకాంతరావు, కోశాధికారి పి.నారా యణరెడ్డి అభినందించారు. ఈ కార్యక్రమంలో ఐక్యూఏసీ కో–ఆర్డినేటర్ ప్రొ.ఈశ్వరయ్య, ట్రిపుల్ఈ హెచ్ఓడీ ప్రొ.సి.వెంకటేశ్, ప్రోగ్రాం కో–ఆర్డినేటర్లు టి.ప్రవీణ్‌కుమార్, డాక్టర్ జి.రాజేందర్‌నాయక్, డాక్టర్ ఎ.రాజశేఖర్, సీనియర్ ఫ్యాకల్టీ సభ్యుడు డాక్టర్ పి.నాగార్జునరెడ్డి, డాక్టర్ ఎ.మ ధుకర్, సి.పవన్‌కుమార్, ఫ్యాకల్టీ స్టాఫ్, అసోసియేట్ ప్రొఫెసర్ డాక్టర్ డి.ప్రభాకరాచారి, అధ్యాపక సిబ్బంది, తదితరులు పాల్గొన్నారు.