

Koustuv Technical Campus, Plot No. 1 (A), Koustuv Square, Infocity Road, Patia, Bhubaneswar–751024, Odisha, India
[AFFILIATED TO BPUT, ODISHA]
www.coeb.ac.in

ADD-ON COURSE: Applied System Theory

[Programme: B.Tech, EEE/EE]

## **SYLLABUS**

**Total Lecture Hours: 40** 

## **Course Objectives:**

This course delves into the principles, techniques, and practical applications of system theory in various fields, including engineering, biology, economics, and more. Students will learn to analyze, model, and optimize complex systems, and apply system theory to solve real-world problems.

## MODULE-I Introduction to System Theory

[10 Hours]

Definition and scope of system theory, Importance of systems thinking, Applications of system theory in various disciplines, Types of systems: open, closed, deterministic, stochastic, System components and interactions, System modeling techniques: block diagrams, state-space representation.

## MODULE-II LTI System

[10 Hours]

State Transition Matrix, Solutions to LTI Systems, Solutions to LTV Systems, Equilibrium points, Linearization, Types of Linearization with Examples, Stability, Types of Stability, Lyapunov Equation

## MODULE-III Controllability & Observability

[10 Hours]

Controllability, Reachability, Stabilizability, Tests, Controllable and Reachable Subspaces, Grammians, Controllable Decomposition, Observability, Constructibility, Detectability, Tests, Subspaces, Grammians, State Estimation, Observable Decomposition.

## MODULE-IV Controller Design

[10 Hours]

Kalman Decomposition, Pole Placement, Controller Design, Observer Design, Duality, Minimal Realization, Basics of Optimal Control, LQR, Ricatti Equation, LMIs in Control

Course Outcomes: After completion of the course, the students will be able to

CO1: Understand the fundamental concepts of system theory.

CO2: Apply system theory to analyze and model dynamic systems

CO3: Use system theory tools for optimization and control.

CO4: Apply system theory to address real-world problems across different domains.

CO5: Communicate system analyses effectively through reports and presentations.

## **Evaluation Process:**

- 1. Attendance for the course is 75%, which is mandatory.
- 2. Minimum qualifying marks percentage for the course is 50.
- 3. Certificate will be issued after successful completion of course and assessment processes.

## Learning resources:

## Suggested Books:

- 1. Linear Algebra and its Applications by Gilbert Strang
- 2. Linear Systems Theory by J.H.Hespanha
- 3. Linear System Theory and Design by C.T.Chen
- 4. Introduction to Dynamic Systems by D.G. Luenberger
- 5. Linear Systems 1.111by P. Antsaklis and Anthony N. Michel

## Other Sources:

e-Learning Resources:

https://onlinecourses.nptel.ac.in/noc23 ee144/preview
 Design and Developed by: Prof. Gopal Krishna Mohanty & Prof. Jagatjyoti Ranjan Das

Principal

Principal

HOD, Electrical Engineering

HOD

Electrical Engineering College of Engineering Bhubaneswar



Plot No.1 (A), CNI Complex, Patia, Bhubaneswar – 751024, Odisha, India.

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## NOTICE

## Department of Electrical Engineering Add On Course 2019-2020

Ref No: COEB/EE/2019/0チ

Date: 02.08.2019

It is hereby informed to all the students that the Department of Electrical Engineering is going to start the following Add-on courses for <u>Academic year 2019-2020</u>. All the students are instructed to enroll their names for the following courses <u>on or before 14/08/2019</u>. The classes will be commenced from **16/08/2019**, 5.30pm to 7.30pm. You can contact the following course co-ordinators for enrolment and further queries.

SI. No.	Name of Add-on Course	Sem	Duration in hours	Name of the course co- ordinators
1	Fundamentals of Domestic Appliances	3 <sup>rd</sup>	38	Dr. B Veera Murthy Pandian, Assistant Professor
2	Applied System Theory	5 <sup>th</sup>	40	Jagat Jyoti Ranjan Das, Assistant Professor.
3	Mastering MATLAB through guided problem solving	7 <sup>th</sup>	40	Dr. T C Manjunath, Assistant Professor

HOD

**Electrical Engineering Department** 

Electrical Engineering
College of Engineering Bhubaneswar

Copy to: Principal All Notice Board. A.O(Admin) All HODs Hostel, Security



## COLLEGE OF ENGINEERING BHUBANESWAR (COEB) ADD-ON COURSE

## STUDENT ENROLLMENT SHEET

Name of the Department: ELECTRICAL ENGINEERING

Course Title: Applied System Theory

Semester: 5th

Academic Year: 2019-20

## Student's Declaration/Undertaking

- 1. I do hereby undertake to participate in the above mentioned add on course.
- 2. I do hereby, promise to abide by the admissible rules and regulations, concerning discipline, attendance, etc. of the department, and also to follow the Code of Conduct prescribed for the students of the Institute, as in force from time to time.

Sl. No.	egistration No	Name of the Student	Signature of the Student
1	1701219022	JYOTIPRAKASH DAS	Typh Prakash Das
2	1701219031	ASHUTOSH MISHRA	Ashertosh Mishrea
3	1701219101	SUBHAM MOHAPATRA	Scelbhan Mohapaha
4	1701219169	PRIYE RANJAN KUMAR	Pelya Kanjan Kiman
5	1701219171	RAKESH BEHERA	Ranesh Rehera
6	1701219277	SUBHASMITA SAHOO	SuphaSmita Sahoo
7	1701219278	SUVAKANTA DHALASAMANTA	Savakanta Dhalasamanta
8	1701219279	SATYABRATA AMRUT RANJAN	Satyabooute Amout Temson
9	1701219281	SARTHAK KUMAR JENA	Sarthak Kumer Jona
10	1701219282	SONAM NAYAK	Sonam Nabarc
11	1701219283	SUBHASHREE BEHERA	3abharhree Beherra

2007-10/18/19



## COLLEGE OF ENGINEERING BHUBANESWAR (COEB) DEPARTMENT OF ELECTRICAL ENGINEERING

ADD ON/CERTIFICATE COURSE

## STUDENT ATTENDANCE

Sheet No. 02

Academic Year: 2019-20

Semester: 5th

Course Code (if any):

Duration:

Name of the Course: Applied System Theory

Programme: B.Tech in Electrical Engineering

Enrollment No. 1701219283|SUBHASHREE BEHERA 1701219282 SONAM NAYAK 1701219281 SARTHAK KUMAR JENA 1701219279|SATYABRATA AMRUT RANJAN 1701219278 SUVAKANTA DHALASAMANTA 1701219277 SUBHASMITA SAHOO 1701219101 SUBHAM MOHAPATRA 1701219171 RAKESH BEHERA 1701219169 PRIYE RANJAN KUMAR 1701219031 ASHUTOSH MISHRA Signature of the Course Coordinator 1701219022 JYOTIPRAKASH DAS Reg. No., 5:30 (57:30) pm NAME OF THE STUDENT School Sendir Sange ) confronting Semakanta DhalasandeSustakanta Soothen Ku. Jan Subha Smita Sahoo Subha mita Sahoo Subha Smita Sahoo Subha Smita Sahoo Date: 22 | 08 | 19 | Date: 26 | 08 | 9 | Date: 27 | 08 | 19 | Date: Subban Mohaputy Subham Mohaputu Ashertock Mishera Ashertosta Mishera Thotipaken Dan MANA WARM A WHIN Behira Survivabella A paner Justpaken Das SON MAN Kerlin Kahesh Behera Sublantinge wind Kenjun Kumer Date & Signature of the Student JURIAN MORNE Subhashree En de production investigations Schokara Justprakesh Das Kohesh Behera Sorthox Ku: J+ma range halungsohin Mishard Askutosh Schooling Bolis no Mary Marins Robesh Beher Santrox Ku. Jama Tractor Car Suvaldenta wina Kanjenhum 28/08/19

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## COLLEGE OF ENGINEERING BHUBANESWAR (COEB) DEPARTMENT OF ELECTRICAL ENGINEERING ADD ON/CERTIFICATE COURSE

STUDENT ATTENDANCE

Semester: 5th

Academic Year: 2019-20

Sheet No.

03

Course Code (if any):

Name of the Course: Applied System Theory

Programme: B.Tech in Electrical Engineering

Duration: **Enrollment No.** 1701219283 SUBHASHREE BEHERA 1701219282 SONAM NAYAK 1701219281|SARTHAK KUMAR JENA 1701219278 SUVAKANTA DHALASAMANTA 1701219279 SATYABRATA AMRUT RANJAN 1701219277 SUBHASMITA SAHOO Signature of the Course Coordinator 1701219171|RAKESH BEHERA 1701219169 PRIYE RANJAN KUMAR 1701219101 SUBHAM MOHAPATRA 1701219031 ASHUTOSH MISHRA 1701219022 JYOTIPRAKASH DAS Reg. No., 5:30 to 7:30/pm NAME OF THE STUDENT Savakant a arana Suran Muscle Santon to Iran and 4 recentlins lumina transferences Sulha Smite Choo Subhasmita Sahoo Kakhasmita Subhasmita Sahoo Date: Justpokast Day Mings of anjumbuner 29/08/19 Date: 30/08/19 Date: 04/09/19 Date: h Behera Sortan Ku-Ira Sonom Nubull Subhashrus Suverkanta Para That protect Des That prakes to Ashurtoul Minhara Subban Notinfatue Subban Nohapatu wind Kinjan Human Lakes K Beherr Date & Signature of the Student Subharkeres Sunom Alxandock Mixlura Sevakanta Sorthox W. Jona Kohenk Bellery wind Konfan humer MAZAIC Subhallmes sund that educations Tresporation Day Sava Kanta Sorthox Ko. Jora Subham Mahabana Kaherbecher Mya Kanjan 05/09/19 Los

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## COLLEGE OF ENGINEERING BHUBANESWAR (COEB) DEPARTMENT OF ELECTRICAL ENGINEERING

ADD ON/CERTIFICATE COURSE

STUDENT ATTENDANCE

Sheet No.

70

Academic Year: 2019-20

Name of the Course: Applied System Theory

Programme: B.Tech in Electrical Engineering

Course Code (if any):

Semester: 5th

Duration: **Enrollment No.** 1701219283 SUBHASHREE BEHERA 1701219282|SONAM NAYAK 1701219281 SARTHAK KUMAR JENA 1701219279 SATYABRATA AMRUT RANJAN 1701219278 SUVAKANTA DHALASAMANTA 1701219277 SUBHASMITA SAHOO 1701219171 RAKESH BEHERA 1701219031 ASHUTOSH MISHRA Signature of the Course Coordinator 1701219169 PRIYE RANJAN KUMAR 1701219101 SUBHAM MOHAPATRA 1701219022 JYOTIPRAKASH DAS Reg. No./ 5:30157:30)pm NAME OF THE STUDENT Supplient a monta Suvalgator anal M alus Subject of the party of the par Subhasmita Jahoo Subhasmita Jahoo Subhasmita Sahoo Subhasmita Jahoo Subham Mahabuhu Subham Date: 6/09/19 Souther Kuite Ashertosk Minhoza Justiprokeun Des Justiproposan Dos Justiproposan Dos Kahen Ilbehana Jiya Kunjan Muma Margue See Drawline Belong Bubba April Belong Scothor Ku Transarthor Ku I to Date: 10/09/19 | Date: 11/09/19 Ashundosk Wind mathemators I vilva l'anjan huns Date & Signature of the Student Mehalethal Subham Mohabata Bellong JIMPAH MOUSE Kohesh Behera Junyakanjan Kuma Sava Kanta Mishon Coron Nayak School Phys Subham Sierran De Date: Sarthou Ku-Jran Kockesh Behan Suvalant a with Kanlanhum 12/09/19 land orderyday Shark S

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## COLLEGE OF ENGINEERING BHUBANESWAR (COEB) DEPARTMENT OF ELECTRICAL ENGINEERING ADD ON/CERTIFICATE COURSE

STUDENT ATTENDANCE

Sheet No.\_

20

Name of the Course: Applied System Theory Programme: B.Tech in Electrical Engineering

Semester: 5th

Course Code (if any):

Academic Year: 2019-20

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## COLLEGE OF ENGINEERING BHUBANESWAR (COEB) DEPARTMENT OF ELECTRICAL ENGINEERING

ADD ON/CERTIFICATE COURSE

## STUDENT ATTENDANCE

Sheet No.

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Name of the Course: Applied System Theory Programme: B.Tech in Electrical Engineering

Enrollment No.

Reg. No./

Semester: 5th

Academic Year: 2019-20

Course Code (if any):

Duration: (5:30 ( 7:30) pm 1701219283 SUBHASHREE BEHERA 1701219282 SONAM NAYAK 1701219279 SATYABRATA AMRUT RANJAN 1701219278 SUVAKANTA DHALASAMANTA 1701219281|SARTHAK KUMAR JENA 1701219171 RAKESH BEHERA 1701219169 PRIYE RANJAN KUMAR 1701219022 JYOTIPRAKASH DAS Signature of the Course Coordinator 1701219277 SUBHASMITA SAHOO 1701219101 SUBHAM MOHAPATRA 1701219031 ASHUTOSH MISHRA NAME OF THE STUDENT Sarano Buvakant a Dhalax Subjectsoft 1- Party Sorthor Ku. Ima Sabba Santa Sahar Subhasmifa Sah or Arbertoxh Mishad Althretoxh Mishard Date: 16 / 08 / 19 Date: 19 /08 / 19 Date: 20 /08 / 19 Date: Justipokur Day who of anion kumor laberti Beherer HENDAIC Subjace Schon Kakesh Beheng Deptopostersh Das South to Jin School of the Sc Laiya Kanjan Kumar Date & Signature of the Student Nathan Sorthox Ken Jong Scholboom & power schoboth A. Am Suval(anta Subhasny Fa-Sahow JI KENDY WOOLTS Kakesh Behard Trotopaker Des vina Kanjun Kuman Sublem Whopahu Scrthax Ku. Subhasmita Sqh Judgakor Das Kanesh behe Saylor Santon wind Kanjan Kumo 21/08/19

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PLOT NO-1(A), CNI COMPLEX, PATIA, BHUBANESWAR, KHORDHA, ODISHA-751024





# Certificate of Completion

conducted at College of Engineering Bhubaneswar in the academic year 20	has successfully completed the ADD-ON Course titledApplied System Theory	of Electrical Engg semester_Fifth bea	This is to certify that Mr./MsJYOTIPRAKASH DAS
2019-20	heory	semester Fifth bearing registration number 1701219022	, student of the Department

UE COPY

Coun

Course-Coordinator

Principal



PLOT NO-1(A), CNI COMPLEX, PATIA, BHUBANESWAR, KHORDHA, ODISHA-751024





# Certificate of Completion

ASHUTOSH MISHRA , student of the Department semester Fifth bearing registration number 1701219031  DD-ON Course titled Applied System Theory  ng Bhubaneswar in the academic year 2019-20 .	ofElectrical Enggsemester _Fifthbearing re has successfully completed the ADD-ON Course titledApplied System Theory conducted at College of Engineering Bhubaneswar in the academic year 2019-20
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Course-Coordinator

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Principal

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PLOT NO-1(A), CNI COMPLEX, PATIA, BHUBANESWAR, KHORDHA, ODISHA-751024





# Octificate of Completion

conducted at College of Engineering Bhubaneswar in the academic year $2019-20$ .	has successfully completed the ADD-ON Course titled Applied System Theory	ofElectrical Enggsemester _Fifthbearing registration number1701219101	This is to certify that Mr./MsSUBHAM MOHAPATRA, student of the Department
			nent

COPY A

Course-Coordinator

XE.

Principal



PLOT NO-1(A), CNI COMPLEX, PATIA, BHUBANESWAR, KHORDHA, ODISHA-751024





# Certificate of Completion

has successfully completed the ADD-ON Course titledApplied System Theory	of Electrical Engg.	This is to certify that Mr./Ms.
ADD-ON Course titled _		PRIYE RANJAN KUMAR
Applied System	semester <u>Fifth</u>	NKUMAR
Theory	semester Fifth bearing registration number 1701219169	, student of the Departmen
	9	artment

TRUE COPY

conducted at College of Engineering Bhubaneswar in the academic year\_

2019-20

Course-Coordinator

XE.

Principal



PLOT NO-1(A), CNI COMPLEX, PATIA, BHUBANESWAR, KHORDHA, ODISHA-751024





# Octificate of Oampletion

conducted at College of Engineering Bhubaneswar in the academic year 2019-20	has successfully completed the ADD-ON Course titled Applied System Theory	ofElectrical Enggsemester_Fifthbearing registration number1701219171	This is to certify that Mr./Ms. RAKESH BEHERA , student of the Department
	,	219171	he Department

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Course-Coordinator

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Principal

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## COLLEGE OF ENGINEERING BHUBANESWAR (COEB) ADD-ON COURSE

## STUDENT ENROLLMENT SHEET

Name of the Department: ELECTRICAL AND ELECTRONICS ENGINEERING

Course Title: Applied System Theory

Semester: 5th

Academic Year: 2019-20

## Student's Declaration/Undertaking

- 1. I do hereby undertake to participate in the above mentioned add on course.
- 2. I do hereby, promise to abide by the admissible rules and regulations, concerning discipline, attendance, etc. of the department, and also to follow the Code of Conduct prescribed for the students of the Institute, as in force from time to time.

Sl. No.	egistration N	Name of the Student	Signature of the Student
1	1701219071	SHIB SHANKAR SHAW	Shib Shankar Shaw
2	1701219165	ASHISH KUMAR PODDAR	Archhumas Poddas
3	1701219166	MEGHNATH SOREN	Meghnalli Soren
4	1701219167	VISHAL KUMAR SINGH	Vishal Kumar Singh
5	1701219271	JAGANNATH PRASAD SHA	Jagannath Acasad Sha
6	1701219272	SAI PRAVAT SAMAL	Sai Pravat Samul
7	1701219273	SUJIT KUMAR SAMANTARAY	SWIT Kermon Samontarry
8	1701219274	AMARJIT BEHERA	Amarit Behena.
9	1701219276	MANORAMA SAHOO	Manoramo Salvo o





## DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING COLLEGE OF ENGINEERING BHUBANESWAR (COEB)

ADD ON/CERTIFICATE COURSE

## STUDENT ATTENDANCE

Sheet No. 0

Programme: B.Tech in Electrical and Electronics

Name of the Course: Applied System Theory

Engineering

Semester: 5th

Course Code (if any):

Academic Year: 2019-20

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## COLLEGE OF ENGINEERING BHUBANESWAR (COEB) DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ADD ON/CERTIFICATE COURSE

STUDENT ATTENDANCE

Sheet No. 02

Programme: B.Tech in Electrical and Electronics Engineering

Name of the Course: Applied System Theory

Semester: 5th

Course Code (if any):

Academic Year: 2019-20

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	Signature of the Course Coordinator		1701219276 MANORAMA SAHOO	1701219274 AMARJIT BEHERA	1701219273 SUJIT KUMAR SAMANTARAY	1701219272 SAI PRAVAT SAMAL	1701219271 JAGANNATH PRASAD SHA	1701219167 VISHAL KUMAR SINGH	1701219166 MEGHNATH SOREN	1701219165 ASHISH KUMAR PODDAR	SHIB SHANKAR SHAW	NAME OF THE STUDENT	Duration: (5.30-7.30) Pm	
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## DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING COLLEGE OF ENGINEERING BHUBANESWAR (COEB)

ADD ON/CERTIFICATE COURSE

Sheet No.

03

STUDENT ATTENDANCE

Engineering Programme: B.Tech in Electrical and Electronics

Name of the Course: Applied System Theory

Semester: 5th

Course Code (if any):

Academic Year: 2019-20

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Signature of the Course Coordinator		1701219276 MANORAMA SAHOO	1701219274 AMARJIT BEHERA	1701219273 SUJIT KUMAR SAMANTARAY	1701219272 SAI PRAVAT SAMAL	1701219271 JAGANNATH PRASAD SHA	1701219167 VISHAL KUMAR SINGH	1701219166 MEGHNATH SOREN	1701219165 ASHISH KUMAR PODDAR	1701219071 SHIB SHANKAR SHAW	NAME OF THE STUDENT	Duration: (5.30-7.30) 125
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## COLLEGE OF ENGINEERING BHUBANESWAR (COEB) DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING ADD ON/CERTIFICATE COURSE

STUDENT ATTENDANCE

Sheet No.\_\_\_\_

STUDENT ATTENDANCE

Semester: 5th

Course Code (if any):

Name of the Course: Applied System Theory

Engineering

Programme: B.Tech in Electrical and Electronics

Academic Year: 2019-20

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## DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING COLLEGE OF ENGINEERING BHUBANESWAR (COEB)

ADD ON/CERTIFICATE COURSE

## STUDENT ATTENDANCE

Sheet No.\_

Semester: 5th

Name of the Course: Applied System Theory

Engineering

Programme: B.Tech in Electrical and Electronics

Course Code (if any):

Academic Year: 2019-20

Dure	tion : (5 · 3	Duration : (5.30 - 7.30) Pm		Date & Signature of the	e of the Student	
NO.	SL. Reg. No./ NO. Enrollment No.	NAME OF THE STUDENT	Date: 13/09/19	Date: 13/09/19 Date: 16/09/19 Date:	Date: 17/09/19 Date: 18/09/19	Date: 18
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	Signature of	Signature of the Course Coordinator		8	5	



PLOT NO-1(A), CNI COMPLEX, PATIA, BHUBANESWAR, KHORDHA, ODISHA-751024





# Optificate of Oompletion

nas successfully c	of <u>Electr</u>	This is to certify th
has successfully completed the ADD-ON Course titled Applied System Theory	Electrical & Electronics Engg.	This is to certify that Mr./Ms. SHIB SHANKAR SHAW
ed Applied Syste	semester Fifth	KAR SHAW
m Theory	semester Fifth bearing registration number1701219071	, st
	1701219071	student of the Department

TRUE COPY

conducted at College of Engineering Bhubaneswar in the academic year 2019-20.

Course-Coordinator

Principal

PRINCIPAL College of Engineering Bhubaneswar

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PLOT NO-1(A), CNI COMPLEX, PATIA, BHUBANESWAR, KHORDHA, ODISHA-751024





# Optificate of Oompletion

	has successful	of <u>Ele</u>	This is to certify that Mr./Ms.
	y completed the	Electrical & Electronics Engg.	that Mr./Ms.
	ADD-ON Course titled _	ronics Engg.	ASHUTOSH PRAKASH
	Mastering MATL	semester Seventh bearing registration	RAKASH
777	has successfully completed the ADD-ON Course titled Mastering MATLAB through guided problem solving	earing registration number _	, str
0	blem solving	1601219291	, student of the Department

RUE COPY

Course-Coordinator

Principal

conducted at College of Engineering Bhubaneswar in the academic year\_

2019-20



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# Opritificate of Ocmpletion

TRUE COPY	conducted at Coll	has successfully c	of Electr	This is to certify that Mr./Ms.
COPY	ige of Engineering Bhuba	has successfully completed the ADD-ON Course titled	Electrical & Electronics Engg.	)))
7	conducted at College of Engineering Bhubaneswar in the academic year_	urse titled Applied System Theory	gsemester Fifth	ASHISH KUMAR PODDAR
College of Engineering Bhubaneswar	2019-20	em Theory  NPR	bearing registration number 1701219165	, student of the Department
war				tment

TRUE COPY (A)

Course-Coordinator

Principal



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# Optificate of Oompletion

bearing registration number Theory	This is to certify that Mr./Ms. MEGHINATH SOKEN  of Electrical & Electronics Engg semester Fifth bearing r  has successfully completed the ADD-ON Course titled Applied System Theory  conducted at College of Engineering Bhubaneswar in the academic year 2019-20
student of the Department	

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conducted at College of Engineering Bhubaneswar in the academic year 2019-20

Course-Coordinator

Principal



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# Ocrtificate of Completion

has successfully completed the ADD-ON Course titled Applied Syst	Electrical & Electronics Engg seme	This is to certify that Mr./Ms. VISHAL KUMAR SINGH
Applied System Theory  Applied System Theory  2019-20  Registration of the Property of the Pro	semester Fifth bearing registration number1701219167	SINGH , student of the Department

TRUE COPY

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conducted at College of Engineering Bhubaneswar in the academic year 2019-20

Course-Coordinator

Principal

X.