KANDULA SRINIVASA REDDY MEMORIAL COLLEGE OF ENGINEERING (AUTONOMOUS)

KADAPA-516003. AP

(Approved by AICTE, Affiliated to JNTUA, Ananthapuramu, Accredited by NAAC)

(An ISO 9001-2008 Certified Institution)

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING



VALUE ADDED COURSE

ON

"INTELLIGENT CONTROL TECHNIQUES FOR POWER SYSTEM OPERATION AND CONTROL"

Resource Person : Dr. T. MARIPRASATH, Associate Professor, Dept. of EEE, KSRMCE.

Course Coordinator: Mr. G. HUSSIAN BASHA, Assistant Professor, Dept. of EEE, KSRMCE.

Duration: 09/03/2023 to 28/03/2023.



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Lr./KSRMCE/EEE/2022-23/

Date:06-03-2023.

To The Principal, KSRMCE. Kadapa.

Respected Sir.

Sub: Permission to Conduct Value added Course on "Intelligent control Techniques for Power System operation and Control" 09/03/2023 to 28/03/2023-Reg-Reg.

The Department of Electrical and Electronics Engineering is planning to offer a Value Added Course on "INTELLIGENT CONTROL TECHNIQUES FOR POWER SYSTEM OPERATION AND CONTROL" to B. Tech. students. The course will be conducted from 09/03/2023 to 28/03/2023. In this regard, I kindly request you to grant permission to conduct Value Added Course.

Thanking you sir,

forwarded to Prhapad Sir,

G. Hussian Basha, Assistant Professor,

Yours faithfully,

EEE Dept., KSRMCE.

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Cr./KSRMCE/EEE/2022-23/

Date:07/03/2023

Circular

The Department of Electrical and Electronics Engineering is offering a Value Added Course on "Intelligent control Techniques for Power System operation and Control" from 09/03/2023 to 28/03/2023 to B. Tech students. In this regard, interested students are requested to register their names for the Value Added Course with Course Coordinator.

For further information contact Course Coordinator

Course Coordinator: Mr. G. Hussian Basha, Asst. Professor, Dept. of EEE.-KSRMCE. Contact No: 9985246180.

Dept. of EEE

Cc to:

IQAC-KSRMCE

HEAD Department of Electrical & Electronics Engineering K.S.R.M. College of Engineering Kadapa -516003.



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Date:09.03.23.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS **ENGINEERING**

REGISTRATION FORM

Value Added Course

On

"Intelligent control Techniques for Power System operation and Control" From 09/03/2023 to 28/03/2023.

S.	Full Name	Roll	Branch	Semester	Signature
No		Number			
1	Adimulam Gangadhar	209Y1A0202	EEE	VI	A-Ganardhas
2	Ambavaram Sanjana (W)	209Y1A0203	EEE	VI	-A. Sanjeura
3	Bandi Neeraja Reddy (W)	209Y1A0204	EEE	VI	B. Aleereja Local
4	Chemikala Rama Devi (W)	209Y1A0206	EEE	VI	colama /
5	Duggireddy Dharani (W)	209Y1A0209	EEE	VI	12. Dhaeni
6	Duggireddy Tejaswini (W)	209Y1A0210	EEE	VI	D. Dejaswin
7	Gaddam Harika (W)	209Y1A0211	EEE	VI	Gitteikg.
8	Karnatakam Likhitha (W)	209Y1A0217	EEE	VI	Kitalia
9	Koramutla Mohan Krishna	209Y1A0219	EEE	VI	pristar
10	Madireddy Gowri (W)	209Y1A0223	EEE	VI	N. (90mi
11	Mallem Charan Kumar	209Y1A0226	EEE	VI	Charan
12	Mallela Chandra Bharath	209Y1A0225	EEE	VI	Bharath
	Kumar Reddy				Bush
13	Mudda Maha Lakshmi (W)	209Y1A0227	EEE	VI	Malaen-
14	Nareddy Sasi Rekha (W)	209Y1A0229	EEE	VI	Cantacha
15	Pachipala Yogna (W)	209Y1A0231	EEE	VI	Yound
16	Penugonda Ravi Shankar	209Y1A0233	EEE	VI	Law Sleubar.
17	Pothuraju Sai Vignesh	209Y1A0235	EEE	VI	Coe liquess
18	Ramanaboina Madhu	209Y1A0236	EEE	VI	has Mire
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19	Şale Ramu	209Y1A0239	EEE	VI	Rann.
20	Singarapu Shashikala (W)	209Y1A0247	EEE	VI	Shortikalah
21	Talupula Pallavi (W)	209Y1A0249	EEE	VI	T. Pallar!

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23	Vema Jagadeesh	209Y1A0252	EEE	VI	Sonaghelphr
24	Yangammagari	209Y1A0253	EEE	VI	Can adadelar
	Somashekar Reddy				80.0040.00
25	Arakata Vemula Venkata	219Y5A0202	EEE	VI	you soth
	Yaswanth				J-700 000
26	Busagani Chandra Kumar	219Y5A0203	EEE	VI	characture.
27	Mayakuntla Srinidhi (W)	219Y5A0204	EEE	VI	Sou
28	Muddala Lakshmi Devi	219Y5A0205	EEE	VI	Malado >
	(W)				2) Califm
29	Nagipogu Prudviraj	219Y5A0206	EEE	VI	Rondin
30	Ramanaboina Thirumala	209Y1A0237	EEE	VI	Thising
31	Saggam Sreekanth	209Y1A0238	EEE	VI	Skath
32	Shaik Mahammad Javeed	209Y1A0243	EEE	VI	Stevel
33	Shaik Mohammed Sameera	209Y1A0244	EEE	VI	S. Mas. Somen
34	Gadwala Lingamaiah	209Y1A0212	EEE	VI	G. Consamer
35	Gandla Venkata Sunil	209Y1A0213	EEE	VI	e · l
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36	Dasari Sai Pavan	209Y1A0207	EEE	VI	See forse
37	Katika Mohammed Kaif	209Y1A0218	EEE	VI	1 1
	Ali				Kort
38	Panchamarthi Dayananda	209Y1A0232	EEE	VI	P. Day on do.
39	Shaik Alisha Sameera (W)	209Y1A0241	EEE	VI	'Alin
40	Singamsetty Sudharshan	209Y1A0246	EEE	VI	S. Sydhagshan

HOD of EEE

HEAD Department of Electrical & Electronics Engineering
K.S.R.M. College of Engineering
Kadapa -516003.

Syllabus of Value Added Course

Course Name: Intelligent Control Techniques for Power System Operation and Control

Course Objectives:

- 1. To apply different problem-solving techniques in solving the Unit Commitment and Hydrothermal coordination problems.
- 2. To solve issues related to reactive power requirements in power systems.
- 3. To explain various concepts related to optimal power flow and voltage control concepts.
- **4.** Analyze the application of ICT for protection of power system equipment using ICT Techniques
- 5. To underline the concepts related to electricity markets.

Course Outcomes:

- 1. To understand the fundamentals of Intelligent Control Techniques and Fuzzy Sets
- 2. Demonstrate various neural networks and genetic algorithms
- 3. Review basic concepts related to formulation of optimal power flow and voltage control concepts.
- **4.** Formulate the problems for solving the states estimation of power systems. Testing of various relays using ICT.

UNIT-I

Concept of artificial intelligence, Problem solving methods and searching techniques. Fuzzy sets, Operation on fuzzy sets, Fuzzy relations, Fuzzy measures, Fuzzy logic, Fuzzy controller.

UNIT-II

Fundamental concepts, Basic models, Learning rules, Single layer and multi-layer feed-forward and feedback networks, Supervised and unsupervised learning, Recurrent networks, Modular network, Self organizing maps, Function networks, Neural network controller, Basic principle, Evolution of genetic algorithm, Hybrid genetic algorithm. Hybrid Systems: Integrated neural-fuzzy system simulated evolution for neural network learning, Fast learning algorithms for training NN.

UNIT-III

ICT functions, ICT control of network for protection coordination, Common Format for Transient Data Exchange (COMTRADE). Protection in Distributed Generators (DGs), micro grids and smart grids. Power system protection testing: automatic testing, test methods, maintenance and field testing of relays.

UNIT-IV

Power system protection testing: automatic testing, test methods, maintenance and field testing of relays. ICT based fault detection identification and classification, Adaptive protection coordination.

UNIT-V

Testing of numerical over current relays, under/over frequency relays & differential relays.

Text Books/Reference Books:

- 1. Lin, C., Lee, G., Neural Fuzzy Systems, Prentice Hall International Inc. (2000).
- 2. Rajashekran, S. and VijaylaksmiPai, G.A., Neural Networks, Fuzzy Logic and GeneticAlgorithmSysthesis and Applications, Prentice–Hall of India Private Limited (2004).
- 3. Taylor, C.W., Power System Stability, McGraw-Hill (2007).
- 4. Kosko, B., Neural Networks and Fuzzy Systems: a Dynamical systems Approach to Machine Intelligence, Prentice–Hall of India Private Limited (1992).
- 5. Zurda, J.M., C++ Neural Networks and Fuzzy Logics, BPS Publication (2001).



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SCHEDULE

Department of Electrical and Engineering

Value Added Course

On

"Intelligent Control Techniques for Power System Operation and Control" From 09/03/2023 to 28/03/2023.

Date	Timing	Resource Person	Topic to be covered
09.03.2023	4 PM to 6 PM	Dr. T. Mariprasath	Introduction to the ICT for PSOC
10.03.2023	4 PM to 6 PM	Dr. T. Mariprasath	Concept of artificial intelligence
11. 03.2023	4 PM to 6 PM	Dr. T. Mariprasath	Problem solving methods and
			searching techniques
13. 03.2023	4 PM to 6 PM	Dr. T. Mariprasath	Fuzzy sets, Operation on fuzzy sets,
			Fuzzy relations, Fuzzy measures,
			Fuzzy logic, Fuzzy controller
14. 03.2023	4 PM to 6 PM	Dr. T. Mariprasath	Fundamental concepts, Basic models,
			Learning rules, Single layer and
			multi-layer feed-forward and
			feedback networks, Supervised and
			unsupervised learning, Recurrent
15. 03.2023	4 PM to 6 PM	D. T.M.	networks
13. 03.2023	4 FIVI to 6 FIVI	Dr. T. Mariprasath	Function networks, Neural network
			controller, Basic principle, Evolution
			of genetic algorithm, Hybrid genetic
16. 03.2023	4 PM to 6 PM	Dr. T. Mariprasath	algorithm
10. 03.2025	+ 1 W to 0 1 W	Di. 1. Mariprasaur	Hybrid Systems: Integrated neural-
			fuzzy system simulated evolution for neural network learning, Fast learning
			algorithms for training NN.
17. 03.2023	4 PM to 6 PM	Dr. T. Mariprasath	Introduction to ICT functions, ICT
			control of network for protection
			coordination
18. 03.2023	4 PM to 6 PM	Dr. T. Mariprasath	Common Format for Transient Data
			Exchange (COMTRADE).
20. 03.2023	4 PM to 6 PM	Dr. T. Mariprasath	Protection in Distributed Generators
		•	(DGs), micro grids and smart grids.
21. 03.2023	4 PM to 6 PM	Dr. T. Mariprasath	Power system protection testing:
			automatic testing, test methods,

			maintenance and field testing of
			relays
22. 03.2023	4 PM to 6 PM	Dr. T. Mariprasath	Power system protection testing:
			automatic testing, test methods,
			maintenance and field testing of
			relays
24. 03.2023	4 PM to 6 PM	Dr. T. Mariprasath	ICT based fault detection
			identification and classification,
			Adaptive protection coordination.
25. 03.2023	4 PM to 6 PM	Dr. T. Mariprasath	Testing of numerical over current
		_	relays.
26. 03.2023	4 PM to 6 PM	Dr. T. Mariprasath	under/over frequency relays &
			differential relays
27. 03.2023	4 PM to 6 PM	Dr. T. Mariprasath	Revision & Discussion
28.03.2023	4 PM to 6 PM	Dr. T. Mariprasath	Revision & Discussion

Coordinator(s)

HEAD

Department of Electrical & **Electronics** Engineering K.S.R.M. College of Engineering Kadapa -516003.



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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Attendance sheet of Certification Course on "Intelligent control Techniques for Power System operation and Control" From 09/03/2023 to 28/03/2023.

SI. No.	Name of the Person	Roll No.	09/08/23	10/08/23	11/08/23	13/08/23	14/08/23	15/08/23	16/08/23	17/08/23	18/08/23	20/08/23	21/08/23	22/08/23	23/08/23	24/08/23	25/08/23	2/08/23	28/08/23
1	Adimulam Gangadhar	209Y1A0202	Dow	Dere	Her	Am	Jen	JE	Sa	Jr	Do	Ac	A	R	fe	Jr.	Je	Ar	Lev
2	Ambavaram Sanjana (W)	209Y1A0203	Sen	San	lan	Sen	Scu	Clay	Sew	San	San	Cu	San	Jen.	Can	Ja .	Sau	Sar	Seu
3	Bandi Neeraja Reddy (W)	209Y1A0204	Dy	Py	8	Dy	(Ny	, Dy	By	N _z	De		Dy		Dy	W ₁	D ₂		, Or
4	Chemikala Rama Devi (W)	209Y1A0206	fane	Reme	Rome	Rawa	forma	Rama	Land	Rome	form	r Raus	: Pau	e Raore	Paris	, Kou	e Rang	e Rana	fana
5	Duggireddy Dharani (W)	209Y1A0209	Hen	Bhe	pha	th	Dh	place	d.	da 1	show	Bha	Davi	Dhu	Du	Dh	Bh	The	Dan!
6	Duggireddy Tejaswini (W)	209Y1A0210	D: by	0-hy	orly	Doty	Doly	Dolf	Def	Diff	ody	DA	D.Ay	Doll	John	pols	p.h	pphy	Dhy
7	Gaddam Harika (W)	209Y1A0211	Gibbo	Gold	Get	Gitt	GH	Gold	Gold	Gel	GHA	Gita	Crts	Gitt	Orb	614	Silt	Gift	GFL

8	Karnatakam Likhitha (W)	209Y1A0217	lie	Liblis	die	lilli	Whi	Citla	lik:	Libli	Lite	Life:	lipli	Irol.	In Co	Roll	Lie	Wel.	150l.
9	Koramutla Mohan Krishna	209Y1A0219	k eligh	kin koul	Kindur Korlh	roles post	Kill Kill	the poly	k. velor kvive	k. polin	Miden taisel	k. Mdv krev	Molin	Ky 1 Man Knie	indi	K. Media Graves	Mdn Kri el	side with	k, vdr kn. L
10	Madireddy Gowri (W)	209Y1A0223	Mel			mo	M.60	Met	Melo	mb	106	Mile	Meter	mb	my	muto	Mass	Mds	Mb
11	Mallem Charan Kumar	209Y1A0226	Choin	chen	Clar	Clora	Choli	Claron	Closen	clan	chrown	chan	Clarke	chara	Charen	down	char	clon	chain
12	Mallela Chandra Bharath Kumar Reddy	209Y1A0225	Block	Black	Blook	Bhan	Plost	Block	Blarith	Bhowl	Kharatt	* floret	Bhotall	Morate	Bhavil	Bhotil	Bhero	*Bhari	Bharote
13	Mudda Maha Lakshmi (W)	209Y1A0227	Hole	Ilda	llah	Ileli	llah	llah	Ildh	llah	Mahe	lleh	Ibl	llehe	Iloh	lbh	Man	lbh	llah
14	Nareddy Sasi Rekha (W)	209Y1A0229	Sosi	Sasi	Sasi	Sasi	Sasi	sasî	Sasi	sasi	Sasi	Sasi	Sy,	Sasi	Sasi	Sasi	Sey.	Sai	Sas,
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16	Penugonda Ravi Shankar	209Y1A0233	P. fon	P. Rein Soult	P. Land Sand	Charles	P. Roui Sould	Ekani Sould	W 10	U	P. Farr Saules.	p. Kavr. Sauli	P-Konj Soul	P. Rary Soul	P. Pali Saule	f-Rou, Soul	PROVI Sive	P Vol.	P. Raili
17	Pothuraju Sai Vignesh	209Y1A0235	Sorling	Bregingal	goi tryed	Sulique	Evelig	Coe Vigues	Box Wigh	Goodingui	goe high	goe way	Box Wight	Jose vis great	ga ligh	gov girgo	goe was	Goali Proc	Goe Usquand
18	Ramanaboina Madhu Krishna	209Y1A0236	x2M	154/87	Kort	Karm	Vivi	reigh	ries	Miss	Kaish	reit	dipo	rgish	posit	(ca)	10/1	May	court
19	Sale Ramu	209Y1A0239	Show	Show	Shar	Shen	S. Rom	Show	g. Ron	5. Ruy	Shan	5. Ron	Show	Sakar	Solar	Shan	Shor	Sky	Show
20	Singarapu Shashikala (W)	209Y1A0247	Ked	Shell	La	hed	882	graf	Sels	Kerly	Chall	help	Stel	dis	gha	8 por	ghi.	Char	ghr'
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36	Dasari Sai Pavan	209Y1A0207	200	20	Sto.	Sas		Sac	Colon	ler-	Qa	Q.A.		GA	Seo	SA	6	Ja)	Sut
37	Katika Mohammed Kaif Ali	209Y1A0218	Kand :	Kad	Klab	Kad	Karob	Kado	Harl	Kab	Kada	Heb	Karb	Kalb	Kal	tak	Kan	Kall	, Kab
38	Panchamarthi Dayananda	209Y1A0232	July	pelf	1924	rough	Day	ory	Day	Doy	pay	Dalf	palf	Day	Das	nay	Dy	Day	Day
39	Shaik Alisha Sameera (W)	209Y1A0241	Aliv	Ah	Al	Alı	A	Ah	A	Al	Ah	-Al	A	A	Sh	Al	the	Al	Di
40	Singamsetty Sudharshan	209Y1A0246	Sudo	Suda	Sign	Endo	Soga	Suda	Supe	Led	zwer	gude	(de)	Roge	Sign	Scot	Zule ?	Shor	guda.

Coordinator(s)

HoD HEAD Department of Electrical & Electronics Engineering K.S.R.M. College of Engineering Kadapa -516003.





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Department of Electrical & Electronics Engineering

Value added Course on "Intelligent control Techniques for

Power System Operation and Control"

DATES: 09-03-2023 TO 28-03-2023.

VENUE: SUTIA

Coordinator Mr. G. Hussian Basha **Assistant Professor EEE Department**

Resource Persons

Dr. T.Mariprasath, Assoc., Professor

EEE Department

Dr. M.S. Priyadharshni HOD

Dr.V.S.S.Murthy **Principal**

Prof A.Mohan Director

Dr.K.Chandra Obul Reddy **Managing Director**

Smt.K.Rajeswari Correspondent

Sri K.Madan Mohan Reddy Vice-Chairman

Sri K.Raja Mohan Reddy Chairman





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Report of

Value Added Course on "Intelligent control Techniques for Power System operation and Control" From 09/03/2023 to 28/03/2023

Target Group

B.Tech Students

Details of Participants

40 Students

Co-coordinator(s)

Mr. G. Hussian Basha

Resource Person(s)

Dr. T. Mariprasath

Organizing Department

Electrical and Electronics Engineering

Venue

:

:

SJ 114, EEE Department

Description:

The Department of Electrical and Electronics Engineering conducted a Value Added Course on "Intelligent control Techniques for Power System operation and Control" from 09/03/2023 to 28/03/2023. The course Resource Persons is Dr. T. Mariprasath, Assoc., Professor Department EEE, KSRMCE.

Over the last few years, many problems in the design, management and operation of modern power systems have attracted the attention of researchers – these systems are highly nonlinear, multivariable, and time-varying. These problems may arise from the growth of electrical networks and the high penetration of renewable energy sources in electrical systems.

Recent power systems require more complex control methods to be autonomous, intelligent, and reliable. The application of advanced, modern, and intelligent control systems is considered the primary aspect of enhancing the system's reliability and efficiency. Moreover, more attention should be paid to developing and analyzing the advanced control methods utilized in modern electrical systems, considering theoretical and practical challenging control problems

Photos

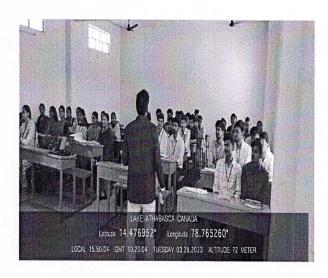
The pictures taken during the course are given below:



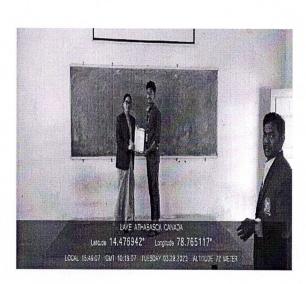
Resource Person Dr. T. Mariprasath, Asso., Prof in EEE, giving Keynote Address.



Coordinator Mr.G. Hussian Basha, Asst., Prof., in EEE, addressing the Gathering.



Participants Keenly Listening the Lecture



Certificates Distribution by the HoD Dr.M.S. Priyadharshni

Coordinator(s)

Electronics Engineering K.S.R.M. College of Engineering

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Certificate of Completion

This is to certify that P. YOGNA	
This is to certify that P. YOGNA	bearing Roll N
<u>२०१५। मेरु १-३।</u> has Sucessfully Completed the Value	Added Course o
"Intelligent Control Techniques for Power System	Operation an
Control " organized by the Department of EEE, K.	S R M College (
Engineering, Kadapa. From 09/03/2023 to 28/03/2023.	onege (
1 11000	

(g. Howelf Coordinator

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V.S.S. Mm/9 **PRINCIPAL**





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KSN

Certificate of Completion

This is to certify that T. PALLAVI	bearing Roll N
<u>20941AD 249</u> has Sucessfully Completed the Value	Added Course of
intelligent Control Techniques for Power System	Operation and
organized by the Department of FFF K	S R M College
Engineering, Kadapa. From 09/03/2023 to 28/03/2023.	ontin conege (

V. S. S. Mm/9 PRINCIPAL



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KSN

Certificate of Completion

This is to certify that G. HARIKA	
"Intelligent Control Technisms 5	bearing Roll N
"Intelligent Control Techniques for Power System Control " organized by the Day	Added Course o
Control " organized by the Department of Power System	Operation an
Control " organized by the Department of EEE, K.S. Engineering, Kadapa. From 09/03/2023 to 28/03/2023.	S.R.M College (
of the string, Radapa. From 09/03/2023 to 28/03/2023.	

Coordinator

HOD EEE.

V.S.S. MW/F PRINCIPAL

Feedback form on Value Added Course "Intelligent control Techniques for Power System operation and Control" 09/03/2023 to 28/03/2023.

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	Email *
2.	Roll Number *
3.	Name of the Student *
l .	The objectives of the Value Added Course were met (Objective) *
	Mark only one oval.
	Excellent
	Good
	Satisfactory
	Poor

 5.	The content of the course was organized and easy to follow (Delivery) *
	Mark only one oval.
	Excellent
	Good
	Satisfactory
	Poor
6.	The Resource Persons were well prepared and able to answer any question(Interaction)
	Mark only one oval.
	Excellent
	Good
	Satisfactory
	Poor
7.	The exercises/role play were helpful and relevant (Syllabus Coverage) *
	Mark only one oval.
	Excellent
	Good
	Satisfactory
	Poor

8.	The Value Added Course satisfy my expectation as a value added Programme * (Course Satisfaction)
	Mark only one oval.
	Excellent
	Good
	Satisfactory
	Poor
9.	Any Information *

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Value added Course on "Intelligent control Techniques for Power System operation and Control" 09/03/2023 to 28/03/2023

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S No.	Email Address	Roll Number	Name of the state		Good	Satisfacto	Good	Excelle	Nothing
		209y1a0202		000		Excellent		Good	Nothing
2	210v520203@ksrmce ac	1219v5a0203 I	BOSAGAM CHAMPIALLO		Good		Good	Good	Nill
	200,1-0217@kcrmca 20	1209v1a0247 1	5. 51185111Kala	-	Good			Good	
1	209v1a0241@ksrmce.ac.	[209Y1A0241]	Shalk Alisha Sameera	Good	Good	Good	Good	Good	Ntg
5	219v5a0204@ksrmce.ac.	219y5a0204	M.Smani	Good	Excellent		Good	Excelle	Nothing
	1 005101	12004220251 1	V vinav		Good	Good	Good	Good	Nothing
7	210v520202@ksrmce ac	1219v5a0202 I	ARAKATA VEMULA VENKA	Good	Excellent	Excellent	Excelle	Good	No
8	200v1a0219@ksrmce ac.	1209v1a0219	Monan Krishna			Good	Good	Good	Nothing
9	200v120200@ksrmce ac	1209v1A0209	D.Dharani	Good	Good	Good		Good	
10	200v1a0232@ksrmce.ac	1209v1a0232	P.Dayananua	Good	Satisfactory	Good			Nothing
11	200v120230@ksrmce ac	1209Y1A0239	S.Ramu		Excellent	Satisfacto		Good	
12	200v1a0212@ksrmce ac	1209v1a0212	G.lingamalan	Good	Good	Good			All going good
13	1200v1a0207@kermce ac	1209v1a0207	ID Sai Pavaii	Excellent		Good		Good	
14	1209v1a0238@ksrmce.ac	.1209y1a0238	Saggam Steekantin	Satisfacto		Good	Excelle	Good	No
15	1200v120240@ksrmce ac	1209v1a0249	T.pallavi	Good	Good	Good		Good	Ntg
16	1000,100006@kcrmce 20	1209v1a0222	IM.Charan Kumai	Excellent		Excellen	Good	Good	
17	200v1a0233@ksrmce.ac	1209Y1A0233	P.RAVI SHANIVAIN	Good	Good	Good	Good		Nothing
18	200v1a0237@ksrmce.ac	:1209v1a0237	R. Mirumaia	Good	Good	Excellen			Nothing
19				Excellen		Excellen	Excelle	Good	5/5 Rating
20	1200v120213@ksrmce ac	: 1209v1a0213	GANDLA VENIVATA COME	Good	Good	Good	Good	Good	
21	1200v120220@kermce ac	1209V1a0229	N.Sasi Nekila	Good	Good	Good	Good		Nothing
22	1000 4-0052@karmon 20	1200/120253	TY Somashekai Teuuy	Excellen		Good			Nothing
23	219v5a0206@ksrmce.ad	.1219y5a0206	NAGIPOGO PRODVITIVA	Good	Good	Good	Excelle		
24	200v1a0223@ksrmce.ad	: 1209v1a0223	IVI.GOWIT	Good	Good	Good	Good		Nothing
25	200v1a0210@ksrmce.ad	1209Y1A021C	D. rejaswini	Good	Good	Exceller	t Good	Good	
26	200v1a0231@ksrmce.ad	c.1209y1a0231	P. Yogna	Good	Good	Good	Good	Good	-
27	209y1a0203@ksrmce.a	c. 209y1a0203	A'99119	300					

28	209y1a0246@ksrmce.ac. 209y1a0246	S. Sudharshan	Good	Good	Good	101	I .	I
29 J	209y1a0244@ksrmce.ac. 209Y1A0244	Shaik Mohammod samoor					Good	
30	219y5a0205@ksrmce.ac. 219y5a0205	M. I-I-I-I in	Good	Good	Good	Good	Good	No
31	200v1c0200@ksimice.ac. 219y5a0205	IVI. Iaksnmi devi	Good	Good	Good	Good	Good	No
0.0	209y1a0206@ksrmce.ac. 209y1a0206	C Ramadevi	Good	Excellent	Good	Excelle		
32	209y1a0211@ksrmce.ac: 209Y1A0211	G Harika	Cood	0			27.0.10000	
33	209y1a0243@ksrmce.ac. 209Y1A0243	SHAIK MAHAMMAD IAVEE	Cood !			Good	Good	Nothing
34	209y1a0218@ksrmce.ac. 209y1a0218	STAIN WATAWWAD JAVEE			Excellent	Excelle	Excelle	NIL Statement
35	200410025204	k monammed kaif ali	Good	Good	Good	Good	Good	No
	209y1a0252@ksrmce.ac. 209y1a0252	VEMA JAGADEESH	Good	Good	Excellent			Nothing
36	209y1a0204@ksrmce.ac. 209y1a0204	B Neeraja Reddy		Good			G000	Nothing
37	000 4 0005 61	D 111			Good	Satisfa	Good	Nothing
38	209v1a0225@ksrmco ac 200v1a0225	MALLEL A CLICKE	Excellent	Good	Satisfacto	Excelle	Good	Nothing
39	209y1a0225@ksrmce.ac. 209y1a0225	MALLELA CHANDRA BHAF	Good	Good			Good	
39	209y1a0235@ksrmce.ac. 209Y1A0235	POTHURAJU SAI VIGNESH	Good	Good				
40	209y1a0227@ksrmce.ac. 209y1A0227							None
		ivi ivianalaksnimi	Good	Excellent	Good	Excelle	Good	_

Coordinator Coordinator

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HOD OF EEE HEAD Department of Electrical & Electronics Engineering K.S.R.M. College of Engineering Kadapa -516003.

K.S.R.M. COLLEGE OF ENGINEERING (AUTONOMOUS), KADAPA-516003 DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING VALUE ADDED COURSE ON

"INTELLIGENT CONTROL TECHNIQUES FOR POWER SYSTEM OPERATION AND CONTROL"

FROM 09/03/2023 TO 28/03/2023 AWARD LIST

S.No	Roll Number	Name of the Student	Marks Obtained
1	209Y1A0202	Adimulam Gangadhar	18
2	209Y1A0203	Ambavaram Sanjana (W)	18
3	209Y1A0204	Bandi Neeraja Reddy (W)	17
4	209Y1A0206	Chemikala Rama Devi (W)	19
5	209Y1A0209	Duggireddy Dharani (W)	17
6	209Y1A0210	Duggireddy Tejaswini (W)	18
7	209Y1A0211	Gaddam Harika (W)	16
8	209Y1A0217	Karnatakam Likhitha (W)	15
9	209Y1A0219	Koramutla Mohan Krishna	16
10	209Y1A0223	Madireddy Gowri (W)	17
11	209Y1A0226	Mallem Charan Kumar	17
12	209Y1A0225	Mallela Chandra Bharath Kumar	16
		Reddy	10
13	209Y1A0227	Mudda Maha Lakshmi (W)	19
14	209Y1A0229	Nareddy Sasi Rekha (W)	18
15	209Y1A0231	Pachipala Yogna (W)	18
16	209Y1A0233	Penugonda Ravi Shankar	16
17	209Y1A0235	Pothuraju Sai Vignesh	17
18	209Y1A0236	Ramanaboina Madhu Krishna	18
19	209Y1A0239	Sale Ramu	18
20	209Y1A0247	Singarapu Shashikala (W)	19
21	209Y1A0249	Talupula Pallavi (W)	17
22	209Y1A0251	Veeramallu Vinay	18
23	209Y1A0252	Vema Jagadeesh	16
24	209Y1A0253	Yangammagari Somashekar Reddy	15
25	219Y5A0202	Arakata Vemula Venkata Yaswanth	17
26	219Y5A0203	Busagani Chandra Kumar	16
27	219Y5A0204	Mayakuntla Srinidhi (W)	16
28	219Y5A0205	Muddala Lakshmi Devi (W)	18
29	219Y5A0206	Nagipogu Prudviraj	17
30	209Y1A0237	Ramanaboina Thirumala	16
31	209Y1A0238	Saggam Sreekanth	17
32	209Y1A0243	Shaik Mahammad Javeed	18
33	209Y1A0244	Shaik Mohammed Sameer	19
34	209Y1A0212	Gadwala Lingamaiah	17
35	209Y1A0213	Gandla Venkata Sunil	16
36	209Y1A0207	Dasari Sai Pavan	17
37	209Y1A0218	Katika Mohammed Kaif Ali	15
38	209Y1A0232	Panchamarthi Dayananda	18

39	209Y1A0241	Shaik Alisha Sameera (W)	19
40	209Y1A0246	Singamsetty Sudharshan	18

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Valued added Course on "Intelligent Control Techniques for Power System Operation and Control"

8	2 2 0 0 0 1 System Speration and Conti
Name of the Student: C. Ramadevi	Date: 28/03/2023
Roll No 20941A0206	Signature of Faculty: 4 Hours
	•

1	Who invented perceptron neural networks?		
	a) McCullocch-pitts	b) Widrow	<u>B</u>]
	c) Minsky & papert	d) Rosenblatt	-
2.	. What is adaline in neural networks?		01
	a) adaptive linear element	b) automatic linear element	
	c) adaptive line element	d) none of the mentioned	
3.	who invented the adaline neural model?		Ω 1
	a) Rosenblatt	b) Hopfield	
	c) Werbos	d) Widrow	
4.	what is the another name of weight update if functionality?	rule in adaline model based on its [<u>C1</u>
	a) LMS error learning law	b) gradient descent algorithm	
	c) both LMS error & gradient descent learning law	d) none of the mentioned	
5.	What is the form of Fuzzy logic?		CI
	a) Two-valued logic	b) Crisp set logic	
	c) Many-valued logic	d) Binary set logic	
6.	3. The truth values of traditional set theory is	and that of fuzzy set is [A
	a) Either 0 or 1, between 0 & 1	b) Between 0 & 1, either 0 or 1	
—	c) Between 0 & 1, between 0 & 1	d) Either 0 or 1, either 0 or 1	
7.	The room temperature is hot. Here the hot (use of l represented by	linguistic variable is used) can be	B
	a) Fuzzy Set	b) Crisp Set	
	c) Fuzzy & Crisp Set	d) None of the mentioned	
8.	The values of the set membership is represented b	у[BL
	a) Discrete Set	b) Degree of truth	
	c) Probabilities	d) Both Degree of truth & Probabilities	
9.	Fuzzy Set theory defines fuzzy operators. Choose t following.	the fuzzy operators from the [D)
	a) AND	b) OR	
	c) NOT	d) All of the mentioned	
10.	There are also other operators, more linguistic in na applied to fuzzy set theory.	ature, called that can be [91
	a) Hedges	b) Lingual Variable	

1	c) Fuzz Variable	d) None of the mentioned	
11.	Fuzzy logic is usually represented as	by Frence of the mentioned	[[7]]
	a) IF-THEN-ELSE rules	b) IF-THEN rules	[13]
2	c) Both IF-THEN-ELSE rules & IF-THEN rules	d) None of the mentioned	
10			
12.	is/are the way/s to represent uncertai		D
	a) Fuzzy Logic	b) Probability	
12	c) Entropy	d) All of the mentioned	
13.	are algorithms that learn from the	ir more complex environments (hence	[e]
	eco) to generalize, approximate and simplify solut a) Fuzzy Relational DB		
	c) Fuzzy Set	b) Ecorithms	
14.		d) None of the mentioned	-
17.	Which of the following is/are type of fuzzy interfe	erence method	[D]
	a) mamdani	1)	
	c) rivest	b) sugeno	
15.	Backpropagation can be defined as	d) only a and b	
13.	-		$\begin{bmatrix} C \end{bmatrix}$
	a)It is another name given to the curvy function	b)It is the transmission of errors back	through the
	in the perceptron.	network to adjust the inputs.	
	c)It is the transmission of error back through the	d)None of the above	
58	network to allow weights to be adjusted so that		
1.0	the network can learn.		
16.	Which of the following exhibits non-linear functio	ns to any desired degree of accuracy?	[]
	a)Neuro-fuzzy	b)Neuro-genetic	
	c)Fuzzy-genetic	d)None of the above	
17.	A perceptron adds up all the weighted inputs it rec	ceives, and if it exceeds a certain	[0]
	value, it outputs a 1, otherwise it just outputs a 0.		17
	a) True	b) False	
	c) Sometimes – it can also output intermediate	d) Can't say	
1.0	values as well		
18.	What is the name of the function in the following s	tatement "A perceptron adds up all	[B]
	the weighted inputs it receives, and if it exceeds a cit just outputs a 0"?	certain value, it outputs a 1, otherwise	- 67
	a) Step function		
	c) Logistic function	b) Heaviside function	
19.	What is true regarding backpropagation rule?	d) Perceptron function	
17.	a) it is also called generalized delta rule		$[\mathcal{D}]$
	a, it is also eather generalized delta rule	b) error in output is propagated backwa	rds only
	c) there is no feedback of signal at nay stage	to determine weight updates	
20.	What are general limitations of back propagation ru	d) all of the mentioned	
	a) local minima problem		
	c) scaling	b) slow convergence	
	o) bouring	d) all of the mentioned	



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Valued added Course on "Intelligent Control Techniques for Power System Operation and Control"

Name of the Student: M. Lakshmi Dewi Roll No.. 2945AD2D5

Date: 28.03.2023.

Signature of Faculty: 4 How f

1	Who invented perceptron neural networks?	
	a) McCullocch-pitts	b) Widrow
	c) Minsky & papert	d) Rosenblatt
2.	. What is adaline in neural networks?	[A]
	a) adaptive linear element	b) automatic linear element
	c) adaptive line element	d) none of the mentioned
3.	who invented the adaline neural model?	
	a) Rosenblatt	b) Hopfield
	c) Werbos	d) Widrow
4.	what is the another name of weight update	rule in adaline model based on its [C 1/
	functionality?	I day a moder based on his [
	a) LMS error learning law	b) gradient descent algorithm
	c) both LMS error & gradient descent learning	d) none of the mentioned
	law	
5.	What is the form of Fuzzy logic?	
	a) Two-valued logic	b) Crisp set logic
	c) Many-valued logic	d) Binary set logic
6.	3. The truth values of traditional set theory is	and that of fuzzy set is
	NEW COLUMN	
	a) Either 0 or 1, between 0 & 1	b) Between 0 & 1, either 0 or 1
7	c) Between 0 & 1, between 0 & 1	d) Either 0 or 1, either 0 or 1
7.	The room temperature is hot. Here the hot (use of	linguistic variable is used) can be
5	represented by	
	a) Fuzzy Set	b) Crisp Set
0	c) Fuzzy & Crisp Set	d) None of the mentioned
8.	The values of the set membership is represented by	
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0	c) Probabilities	d) Both Degree of truth & Probabilities
9.	Fuzzy Set theory defines fuzzy operators. Choose	the fuzzy operators from the
	following.	
	a) AND	b) OR
10.	c) NOT	d) All of the mentioned
10.	There are also other operators, more linguistic in r	nature, called that can be [
	applied to fuzzy set theory. a) Hedges	h) Lingual Variable
	a) Houges	i ni i ingliai Variable

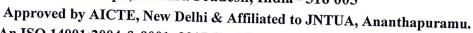
1	c) Fuzz Variable	1))] (.1	
11.	Fuzzy logic is usually represented as	d) None of the mentioned	
11.	a) IF-THEN-ELSE rules	1 \ ID (DIXE) 1	[3]
	a) II - ITTEN-ELSE Tutes	b) IF-THEN rules	
	c) Both IF-THEN-ELSE rules & IF-THEN rules	d) None of the mentioned	
	, and a second s	d) None of the mentioned	
12.	is/are the way/s to represent uncertain	nty.	[]
	a) Fuzzy Logic	b) Probability	
	c) Entropy	d) All of the mentioned	
13.	are algorithms that learn from their	r more complex environments (hence	[Dod
	eco) to generalize, approximate and simplify solut	ion logic.	I CON
	a) Fuzzy Relational DB	b) Ecorithms	
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	in the perceptron.		nough the
	in the perception.	network to adjust the inputs.	
2	c)It is the transmission of error back through the	d)None of the above	
	network to allow weights to be adjusted so that	a) voice of the above	
		w 1	
1.0	the network can learn.		
16.	Which of the following exhibits non-linear function	ns to any desired degree of accuracy?	[C]
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2	c)Fuzzy-genetic	d)None of the above	
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	value, it outputs a 1, otherwise it just outputs a 0.		
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0	values as well		
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	the weighted inputs it receives, and if it exceeds a c	certain value, it outputs a 1, otherwise	
	it just outputs a 0"? a) Step function		
		b) Heaviside function	
19.	c) Logistic function What is true regarding background in 1.2	d) Perceptron function	
17.	What is true regarding backpropagation rule?		$[\Lambda]$
	a) it is also called generalized delta rule	b) error in output is propagated backward	ds only
	c) there is no foodback of -i	to determine weight updates	
20.	c) there is no feedback of signal at nay stage	d) all of the mentioned	
20.	What are general limitations of back propagation ru		$[igstar{igstar}{igstar}]$
	a) local minima problem	b) slow convergence	
	c) scaling	d) all of the mentioned	

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Valued added Course on "Intelligent Control Techniques for Power System Operation and Control"



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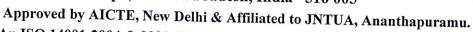


Name	No 20941A0202	Date: 28/03/2023 Signature of Faculty: 4 House
Roll N	No 20941A0209	Simula CR 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
		Signature of Faculty: U 713000
1	Who invented perceptron neural networks?	
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2.	. What is adaline in neural networks?	d) Rosenblatt
	a) adaptive linear element	[A]
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-	a) Rosenblatt	$[\mathcal{D} V]$
	c) Werbos	b) Hopfield
4.		d) Widrow
4.	what is the another name of weight update functionality?	rule in adaline model based on its [_]
	a) LMS error learning law	b) gradient descent algorithm
	c) both LMS error & gradient descent learning	d) none of the mentioned
	law	a)
5.	What is the form of Fuzzy logic?	
	a) Two-valued logic	b) Crisp set logic
	c) Many-valued logic	d) Binary set logic
6.	3. The truth values of traditional set theory is	and that of fuzzy set is
		and that of fuzzy set is
	a) Either 0 or 1, between 0 & 1	b) Between 0 & 1, either 0 or 1
	c) Between 0 & 1, between 0 & 1	d) Fither 0 or 1 either 0 or 1
○ 7.	The room temperature is hot. Here the hot (use of	linguistic variable is used) can be
	represented by	φ dia σο
	a) Fuzzy Set	b) Crisp Set
	c) Fuzzy & Crisp Set	d) None of the mentioned
8.	The values of the set membership is represented by	
	a) Discrete Set	b) Degree of truth
	c) Probabilities	d) Both Degree of truth & Probabilities
9.	Fuzzy Set theory defines fuzzy operators. Choose to	the fuzzy encuet - C
	following.	the fuzzy operators from the $[p]$
	a) AND	b) OR
	c) NOT	d) All of the mentioned
10.	There are also other operators, more linguistic in n	ature called the menuoned
	applied to fuzzy set theory.	ature, called that can be []
	a) Hedges	b) Lingual Variable
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	c) Fuzz Variable	d) None of the mentioned
11.	- Jagre is abatily represented as	a) Frome of the mentioned
	a) IF-THEN-ELSE rules	b) IF-THEN rules
-		
14	c) Both IF-THEN-ELSE rules & IF-THEN rules	d) None of the mentioned
12.	is are the way's to represent uncertainty	inty.
	a) Fuzzy Logic	b) Probability
12	c) Entropy	d) All of the mentioned
13.		eir more complex agricultural (1)
	eco) to generalize, approximate and simplify solu	ation logic.
	a) Fuzzy Relational DB	b) Ecorithms
14.	c) Fuzzy Set	d) None of the mentioned
14.	Which of the following is/are type of fuzzy interf	Perence method
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	c) rivest	b) sugeno
15.		d) only a and b
13.	Backpropagation can be defined as	[C]
	a)It is another name given to the curvy function	b)It is the transmission of errors back through the
	in the perceptron.	network to adjust the inputs.
	c)It is the transmission of error back through the	d)None of the above
	network to allow weights to be adjusted so that	
	the network can learn.	
16.	Which of the following exhibits non-linear factor	
	Which of the following exhibits non-linear function	
	a)Neuro-fuzzy	b)Neuro-genetic
17	c)Fuzzy-genetic	d)None of the above
17.	A perceptron adds up all the weighted inputs it re	ceives, and if it exceeds a certain
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	a) True	b) False
	c) Sometimes – it can also output intermediate values as well	d) Can't say
18.		
10.	What is the name of the function in the following the weighted inputs it receives and if it	statement "A perceptron adds up all [Z] \
	the weighted inputs it receives, and if it exceeds a it just outputs a 0"?	certain value, it outputs a 1, otherwise
	a) Step function	1.) 11
	c) Logistic function	b) Heaviside function
19.	What is true regarding backpropagation rule?	d) Perceptron function
,	a) it is also called generalized delta rule	b) error in output is any visual limit in
_		b) error in output is propagated backwards only to determine weight updates
	c) there is no feedback of signal at nay stage	d) all of the mentioned
20.	What are general limitations of back propagation r	nle?
	a) local minima problem	
	c) scaling	b) slow convergence
		d) all of the mentioned

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Kadapa, Andhra Pradesh, India-516 005



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Valued added Course on "Intelligent Control Techniques for Power System Operation and Control"

Name of the Student: K. MOHAMMED Kaif All	Date: 28/03/2023
Roll No. 20941A0218	Date: <u>28/03/2023</u> Signature of Faculty: 4 + H

1	The same of perception neutral networks:	
	a) McCullocch-pitts	b) Widrow
	c) Minsky & papert	d) Rosenblatt
2.	. What is adaline in neural networks?	
	a) adaptive linear element	b) automatic linear element
	c) adaptive line element	d) none of the mentioned
3.	who invented the adaline neural model?	
	a) Rosenblatt	b) Hopfield
	c) Werbos	d) Widrow
4.	4. what is the another name of weight update rule in adaline model based on its functionality?	
	a) LMS error learning law	b) gradient descent algorithm
	c) both LMS error & gradient descent learning law	d) none of the mentioned
5.	What is the form of Fuzzy logic?	
	a) Two-valued logic	b) Crisp set logic
	c) Many-valued logic	d) Binary set logic
6.	3. The truth values of traditional set theory is	and that of fuzzy set is [A]
	a) Either 0 or 1, between 0 & 1	b) Between 0 & 1, either 0 or 1
	c) Between 0 & 1, between 0 & 1	d) Fither 0 or 1 either 0 or 1
7.	The room temperature is hot. Here the hot (use of linguistic variable is used) can be represented by	
	a) Fuzzy Set	b) Crisp Set
	c) Fuzzy & Crisp Set	d) None of the mentioned
8.	The values of the set membership is represented by	y [12]
	a) Discrete Set	b) Degree of truth
_	c) Probabilities	d) Both Degree of truth & Probabilities
9.	Fuzzy Set theory defines fuzzy operators. Choose following.	the fuzzy operators from the [D]
	a) AND	b) OR
1.0	c) NOT	d) All of the mentioned
10.	There are also other operators, more linguistic in n applied to fuzzy set theory.	ature, called that can be [A]
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Υ		c) Fuzz Variable	J) NI - C.1	
	11.	Fuzzy logic is usually represented as	d) None of the mentioned	1
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		, and the second	b) IF-THEN rules	
		c) Both IF-THEN-ELSE rules & IF-THEN rules	1) N	
		==== rules & II - ITIEN Tules	d) None of the mentioned	
	12.	is/are the way/s to represent uncerta		
		a) Fuzzy Logic		[D]
		c) Entropy	b) Probability	
	13.		d) All of the mentioned	
		eco) to generalize, approximate and simplify solu	eir more complex environments (hence	[4]
		a) Fuzzy Relational DB		13
		c) Fuzzy Set	b) Ecorithms	
1	14.	Which of the following is/are type of fuzzy interfe	d) None of the mentioned	
		intelligible of fuzzy miterio	erence method	[D]
		a) mamdani	b) sugar	
		c) rivest	b) sugeno	
1	5.	Backpropagation can be defined as	d) only a and b	
1				[C]
		a)It is another name given to the curvy function	b)It is the transmission of errors back	through the
		in the perceptron.	network to adjust the inputs.	and the
		N. 1		
		c)It is the transmission of error back through the		
		network to allow weights to be adjusted so that		
		the network can learn.		
10	6.	Which of the following exhibits non-linear function		
		a)Neuro-fuzzy	is to any desired degree of accuracy?	$[D_{\rightarrow}]$
			b)Neuro-genetic	
17	7	c)Fuzzy-genetic	d)None of the above	
1 /	, ·	A perceptron adds up all the weighted inputs it rec	ceives, and if it exceeds a certain	[]
		value, it outputs a 1, otherwise it just outputs a 0. a) True		[-]-]
			b) False	
		c) Sometimes – it can also output intermediate values as well	d) Can't say	
18	3.			
		What is the name of the function in the following s the weighted inputs it receives, and if it every and it ev	tatement "A perceptron adds up all	[g]
		the weighted inputs it receives, and if it exceeds a cit just outputs a 0"?	certain value, it outputs a 1, otherwise	- 5 -
		a) Step function	b) II ' ' 1 C	
		c) Logistic function	b) Heaviside function	
19		What is true regarding backpropagation rule?	d) Perceptron function	
		a) it is also called generalized delta rule	h)	$[\mathcal{D}]$
		Sometanized della fulc	b) error in output is propagated backwa	rds only
		c) there is no feedback of signal at nay stage	to determine weight updates	
20.		What are general limitations of back propagation ru	d) all of the mentioned	
		a) local minimo problem		$[\mathcal{D}]$
		c) scaling	b) slow convergence	
			d) all of the mentioned	

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Valued added Course on "Intelligent Control Techniques for Power System Operation and Control"

Name of the Student: 29 110 237

Roll No.. R. Time of the Student Stud

Nam	e of the Student: 237	Date: 9,8 .02.900 9
Roll	No. R. Tivumala	Date: 28 · 03 · 2023 Signature of Faculty: 4 + 1500
	10000	Signature of Faculty:
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	a) AND	b) OR
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10.	There are also other operators, more linguistic in n	nature, called that can be
	applied to fuzzy set theory.	
*	a) Hedges	b) Lingual Variable

	c) Fuzz Variable	
11.	5	d) None of the mentioned
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		b) IF-THEN rules
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	values as well	d) Can't say
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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

VALUE ADDED COURSE ON
"INTELLIGENT CONTROL TECHNIQUES
FOR POWER SYSTEM OPERATION
AND CONTROL"

Introduction to Intelligent Control & Fuzzy Logic

Learning Outcomes

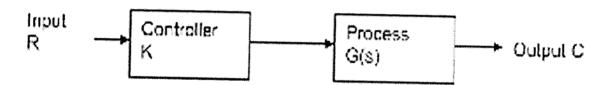
In this topic we shall look at the fundamentals of intelligent control and fuzzy logic. At the end of this topic you should be able to:

- Define intelligent control.
- Define fuzzy logic.
- Explain the structure and operation of fuzzy logic controllers/systems
- Create a fuzzy logic system in Matlab.
- Explain the application of fuzzy logic in mechatronic systems.

Introduction to Intelligent Control

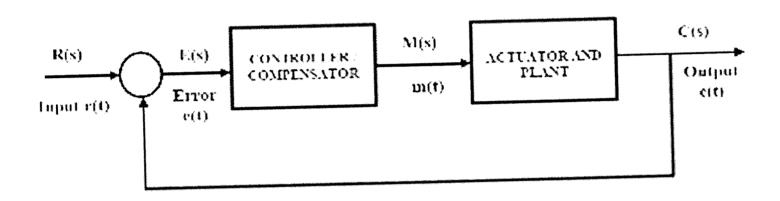
What is Normal (Classical) Control?

- Open loop control system
 - Signal is sent to plant (mechatronic device) in order to make it move to a certain position
 - o No feedback to tell if the target has been reached



- Closed-loop control system
 - Output of the plant is feedback to the input side

 Error between input and output is applied to a controller which then controls the plant



- The whole idea behind classical control is that the system to be controlled requires a model.
- The success of the system depends on the accuracy of this model and controller parameters (e.g. PID controller gains).
- The model and the parameters are rigid (i.e. fixed) E.g. first and second order systems and PID controller equation

First order system:
$$G(s) = \frac{1}{T_N + 1}$$

Second order system:
$$G(s) = \frac{1}{s^2 + 2\zeta \omega_n s + \omega_n^2}$$

$$G_e(s) = k_e \left[1 - \frac{1}{\tau_i s} + \tau_d s\right]$$

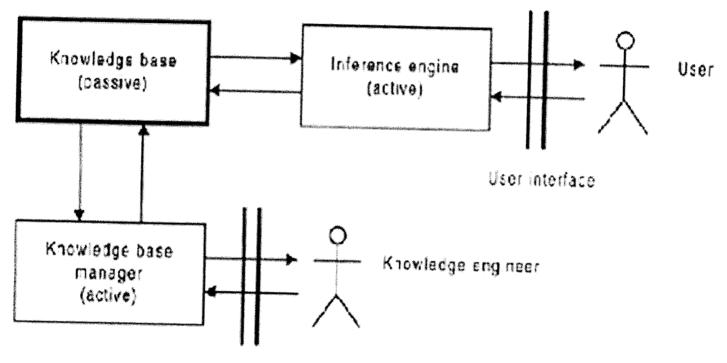
PID controller TF:

What about Intelligent Control?

 The premise behind intelligent control is that the system to be controlled does not have to be rigidly modelled.

- This is unlike classical control and is the biggest distinction between the two approaches.
- Humans can perform complex tasks without knowing exactly how they do them (and without using a rigid model).
- Therefore, one may say that an intelligent method solves
 - A difficult (non-trivial, complex, usually large or complicated) problem
 - o In a non-trivial human-like way
- Types of intelligent control include:
 - Fuzzy logic
 - Artificial neural networks
 - Genetic programming
 - Support vector machines
 - Reinforcement learning
- We shall consider Fuzzy logic and artificial neural networks

Components of Intelligent Systems



Developers' interface

Structure of intelligent system

- Two categories of components
 - Software Elements
 - Knowledge Base similar to a database, stores rules and relationships between data elements
 - Inference Engine is the processing (program) element. Performs reasoning using knowledge base content and inputs
 - Knowledge base manager resource and consistency management of the knowledge base and relationships between knowledge items

c Users

- Knowledge Engineer design, implement, verify, validate the system
- User person or (process/plant/device) that connects to the inference engine

WHAT IS FUZZY LOGIC?

°Fuzzy

Fuzzy – "not clear, distinct, or precise; blurred"

Fuzzy logic

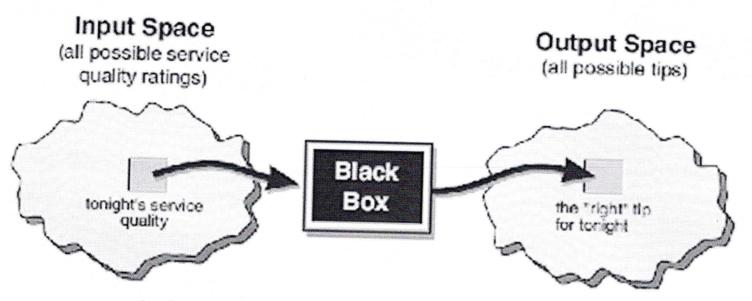
A form of knowledge representation suitable for notions that cannot be defined precisely, but which depend upon their contexts.

Introduction to Fuzzy Logic

What is Fuzzy Logic?

- Fuzzy logic like most of the intelligent control methods attempts to model the way of reasoning that goes on in the human brain.
- It is based on the idea that human reasoning is approximate, non-quantitative, and non-binary. In many cases, there is no black and white answer, but shades of grey
- The simplest example is temperature. Usually when you as someone the temperature they respond with "cool", "warm", "hot", "very hot" as opposed to telling the exact temperature such as "28.5 degrees" or "33.1 degrees"

 Fuzzy logic is a convenient way to map input space to output space. E.g. How much to tip at a hotel? Input space is the quality of service and output space is the amount of tip.



An input-output map for the tipping problem: "Given the quality of service, how much should I tip?"

Why use Fuzzy Logic?

Advantages over 'conventional' or 'classical' control:

- Don't need a good mathematical model of process being controlled.
- Control system requires less information
- Can be quicker to implement
- Rules (more details later) can be tested individually

Other advantages include:

- 1. Conceptually easy to understand mathematical concepts are simple
- 2. Flexible easy to layer on more functionality to existing system

3. Fuzzy logic is tolerant of imprecise data

Applications in Mechatronics include:

- 1. Speed and position control in mechatronic systems (alternative to PID controllers)
- 2. Robot trajectory control and obstacle avoidance
- 3. Control of appliances such as washing machines

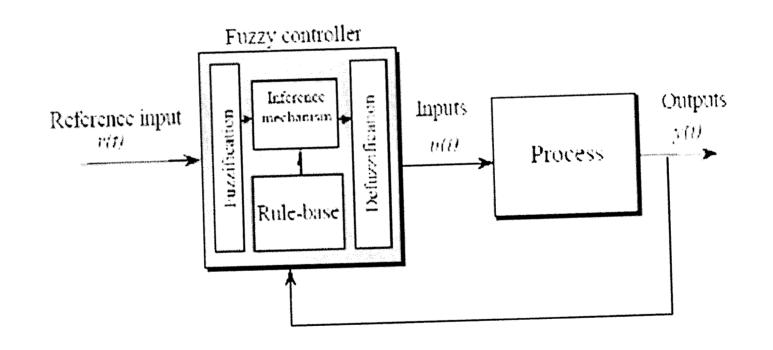
General Approach to Fuzzy Logic Control

The general approach to designing a fuzzy logic controller is made up 5 steps. These steps are

- 1. Define the Input and Output Variables
- 2. Define the subsets (Fuzzy sets) intervals

- 3. Choose the Membership Functions
- 4. Set the IF-THEN rules
- 5. Perform calculations (using Fuzzy Inference) and adjust rules

The block diagram of a fuzzy controller is shown below.



We shall look at Fuzzy sets, Membership Functions, IF-THEN rules, and Fuzzy Inference in the next section. Fuzzy Inference is the combination of Fuzzification, the Inference Mechansim and Defuzzification

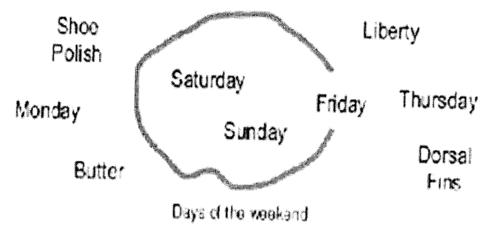
Components of Fuzzy Logic

Fuzzy Sets

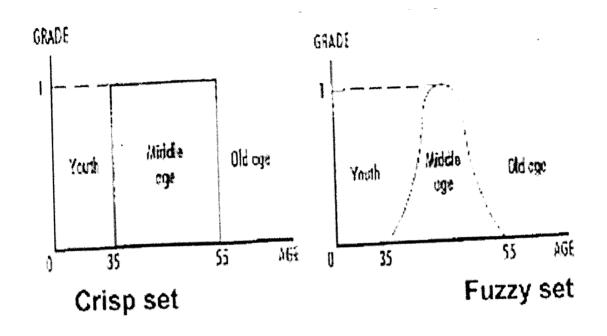
- Fuzzy logic relies on the notion of fuzzy sets
- A fuzzy set is a set without any crisp, clearly defined boundaries.
- It can contain elements with a partial degree of membership.
- Classical sets either wholly include an element or wholly exclude it. E.g. a set of the days of the week



 An example of a fuzzy set would the set of days that make up the weekend



 Another example is age. If we were to ask "what is middle age?, we would be inclined to classify middle age on grade so that we classify middle age as fuzzy, rather than a crisp set.



The curve in the fuzzy set that defines middle age is a function that maps the input space (age) to the output space (middle agedness or grade). Specifically, this is known as a membership function.

Membership Functions

- A membership function (MF) is a curve that defines how each point in the input space is mapped to a membership value (or degree of membership) between 0 and 1.
- The input space is sometimes referred to as the universe of discourse.
- The output-axis is a number known as the membership value between 0 and 1.
- The curve is known as a membership function and is often given the designation of μ .

The only condition a membership function must satisfy is that it must vary between 0 and 1.