(An Empowered Autonomous Institute Affiliated to Shivaji University, Kolhapur)

NAAC Accredited with A+ Grade, ISO 9001:2015 Certified



# DEPARTMENT: Mechanical Engineering CURRICULUM

Minor in "Industrial Automation"

With effect from 2024-25



**Dean Academics** 

Director



(An Empowered Autonomous Institute Affiliated to Shivaji University, Kolhapur)

### **Teaching and Evaluation Scheme for Minor in "Industrial Automation"**

				T	'each	ing S	cheme			Eva	luatio	n sch	eme	
Sr.	Course Code	Course Title	Seme				Contact	Course	•	Theory	7	Prac	tical	
No.			ster	L	T	P	Hrs/wk	Credits		IE .	SEE	CIE	SEE	Total
							-7		SE-I	SE-II				
01	01MEMDL2201	Introduction to Automation	Ш	2			2	2	25	25	50			100
02	01MEMDP2202	Introduction to Automation Lab	Ш			2	2	1				50		50
03	01MEMDL2203	Mechatronics	IV	2			2	2	25	25	50			100
04	01MEMDP2204	Mechatronics Lab	IV			2	2	1				50		50
05	01MEMDL2301	Industrial Robotics	٧	2			2	2	25	25	50			100
06	01MEMDP2302	Industrial Robotics Lab	٧			2	2	1				50		50
07	01MEMDL2303	Control Systems	VI	2			2	2	25	25	50			100
08	01MEMDP2304	Control Systems Lab	VI			2	2	1				50		50
09	01MEMDP2401	Capstone Project	VII			4	4	2				50		50
			Total	8		12	20	14	100	100	200	250		650

L- Lecture T-Tutorial P-Practical SE-I: Semester Examination-I SE-II: Semester Examination-II CIE – Continuous in Semester Evaluation SEE- Semester End Examination



Course	01MEMDL2201	Course	3. Tech. (Mechanical) (Semontrial Introduction to Automat				
Code	02.002.002	Name					
	eaching Scheme			Ev	aluation Sche	me	
L			S	E-I Marks	SE-II Marks	SEE Marks	
2	2			25	25	50	
Course	Objectives:					I	
		s to automati	on and basic elements of au	tomated sy	rstems.		
02 1	To provide students v	vith knowledg	e of levels of automation, t	ransfer line	s and automa	ited	
r	material handling systems.						
03 7	To explain the fundamentals of industrial controllers and sensors used in automation system.						
04 7	To introduce students	s to various a	plications of industrial auto	mation in	Industrial field	d.	
Course	Outcomes:						
At the e	end of the course, stu	dents will be	able to				
01   9	Students will able to I	Describe and	discuss concepts related to	automatior	n, industrial co	ontrol, PLC,	
S	sensors, etc.						
			ropriate components of aut				
		select actuato	rs and mechanisms for a giv	en Industri	ial application	for	
	automation.						
			oblems with traditional sys	tem and su	ggest solution	for the	
<b>8</b>	given application for i	mplementati	on of automation.				
			Course Contents				
Unit I			tion to Automation >			Hours	
-	· · · · · · · · · · · · · · · · · · ·	•	Definition of Automation, Au		_	•	
		/programma	ole/ flexible, Need of autom	ation, Basic	c elements of	automated	
systems Unit II		4 A atriata	us and us ashanians s			Harma	
Unit ii			rs and mechanisms >	-1		Hours	
N 4 = = l= =	nical Actuation Syster		, Phelimatic Actilation Syste				
	•		•	em, Electric	ai Actuation 3	ystem-I,	
Electric	al Actuation System-I	I, Data Presei	ntation system	em, Electric			
Electrica Unit II	al Actuation System-I	I, Data Preser	ransfer Lines >		4	Hours	
Electrica Unit II Fundam	al Actuation System-I I nentals of transfer lin	I, Data Presei  < T es, Configura	ntation system		4	Hours	
Electrica Unit II Fundam for auto	al Actuation System-I I nentals of transfer lin omated production lin	I, Data Presei  < T es, Configura nes.	ratation system ransfer Lines > rions, Transfer mechanisms,	Applicatio	ns, System co	Hours nfigurations	
Electrica Unit II Fundam for auto Unit IN	al Actuation System-I I nentals of transfer lin omated production lin /	I, Data Presei	ratation system ransfer Lines > cions, Transfer mechanisms, laterial Handling Systems >	Applicatio	ns, System co	Hours nfigurations Hours	
Unit II Fundam for auto Unit IV Definition	al Actuation System-I I nentals of transfer lin omated production lin /	I, Data Preser < T es, Configura- nes. Automated M material hance	ransfer Lines > ions, Transfer mechanisms, aterial Handling Systems > ling, Principles, Symptoms of	Applicatio	ns, System co  5  erial handling,	Hours Infigurations Hours Selection	
Unit II Fundam for auto Unit IN Definition	al Actuation System-I I nentals of transfer lin omated production lin /  on and objectives of orial handling equipm	I, Data Preser  < T es, Configura nes.  Automated N material hance ent, Automate	ratation system ransfer Lines > cions, Transfer mechanisms, laterial Handling Systems > ling, Principles, Symptoms of	Application of bad mated dvantages	ns, System co  5  erial handling,	Hours Infigurations Hours Selection	
Unit II Fundam for auto Unit II Definition Application	al Actuation System-I I nentals of transfer lin omated production lin /  on and objectives of rial handling equipm tions, Introduction to	I, Data Preser  < T es, Configura nes.  Automated N material hance ent, Automated S Automated S	ransfer Lines > cions, Transfer mechanisms, laterial Handling Systems > ling, Principles, Symptoms of ed Guided Vehicle, Types, A storage and Retrieval System	Application of bad mated dvantages	ns, System co  5  erial handling, and Limitation	Hours  Infigurations  Hours  Selection  Ins.,	
Unit II Fundam for auto Unit IV Definitio of mate Applicat	al Actuation System-I I Dentals of transfer linemated production line I	I, Data Preser  < T es, Configura nes.  Automated N material hand ent, Automate Automated S < Inc	ransfer Lines > cions, Transfer mechanisms, laterial Handling Systems > ling, Principles, Symptoms of ed Guided Vehicle, Types, A storage and Retrieval System ustrial Control >	Application of bad mated dvantages n.	ns, System co  5  erial handling, and Limitation	Hours Infigurations Hours Selection Ins, Hours	
Unit II Fundam for auto Unit IX Definitio of mate Applicat Unit V Industri	al Actuation System-I I nentals of transfer lin nmated production lin On and objectives of rial handling equipm tions, Introduction to al control systems in	I, Data Preser  < T es, Configura nes.  Automated M material hand ent, Automate Automated S < Inc process and	ransfer Lines > cions, Transfer mechanisms, laterial Handling Systems > ling, Principles, Symptoms of ed Guided Vehicle, Types, A storage and Retrieval System	Application of bad mated dvantages n.	ns, System co  5  erial handling, and Limitation	Hours Infigurations Hours Selection Ins, Hours	
Unit II Fundam for auto Unit IX Definitio of mate Applicat Unit V Industri	al Actuation System-lentals of transfer linemated production linemated production linemated productions of an and objectives of a rial handling equipmations, Introduction to all control systems in Computer process c	I, Data Preser  < T es, Configura nes.  Automated M material hand ent, Automate Automated S < Inc process and control	ransfer Lines > cions, Transfer mechanisms, laterial Handling Systems > ling, Principles, Symptoms of ed Guided Vehicle, Types, A storage and Retrieval System ustrial Control >	Application of bad mate dvantages n. stries, Con-	ns, System co  5 erial handling, and Limitation  5 tinuous and d	Hours Infigurations Hours Selection Ins, Hours	



Texts E	
1	"Automation, Production Systems and Computer Integrated Manufacturing", Groover, M.P.,
	Pearson Education, ISBN: 81-7808-511-9 2nd Edition (2004)
Refere	nce Books:
1	A textbook on Industrial Robotics by Ganesh Hegde, Laxmi Publication
2	Robotic Engineering: An Integrated Approach by Klafter Richard D., Chmielewski Thomas A.,
2	Negin Michael, PHL Publications
3	"Mechatronics", W. Bolton, Third Edition, Pearson Education
Supple	mentary Readings:
Links:	
1.	https://nptel.ac.in/courses/108105063
2.	https://www.youtube.com/watch?v=t6ppwWZUSEc
3.	https://archive.nptel.ac.in/courses/112/107/112107298/



			ond Year B. Tech. (I			
Cour	se Code	01MEMDP2202	Course Name	Introduction	to Automation Lab	
	Teachir	g Scheme				n Scheme
L	T F	Credits			CIE Marks	SEE Marks
	2	. 1			50	
Cour	se Object	ives:				
01					automated systems.	
02		vide students with ng systems.	knowledge of levels	s of automation	, transfer lines and a	utomated material
03	То ехр	ain the fundamen	tals of industrial cor	ntrollers and ser	nsors used in automa	ntion system.
04	To intr	oduce students to	various applications	of industrial au	utomation in Industri	ial field.
Cour	se Outco	mes:				
At th	e end of	the course, studen	ts will be able to			
01	Studen		cribe and discuss co	ncepts related t	o automation, indus	trial control, PLC,
02		•	ct the appropriate o	omponents of a	nutomation for the g	iven system.
03		ts will able to sele			given Industrial appl	
04			vze the problems w	ith traditional s	ystem and suggest so	olution for the
			ementation of auto		, 55	
	, ,			xperiments		
1	Study of	Automation.		•		
2	-	dy on Automation				
3		Actuators and me				
4	Case stu	dy on Actuators a	nd mechanisms.			
5	Study of	Transfer Lines.				
6	Case stu	dy on Transfer Lin	es.			
7	Study of	Automated Mate	rial Handling Systen	ns.		
8	Case stu	dy on Automated	Material Handling S	Systems.		
9	Study of	Industrial Control		•		
10	Case stu	dy on Industrial Co	ontrol.			
11	Case stu	dy on the differen	t applications of Au	tomation in Ind	ustry.	
		•	· ·		•	
Text	s Books:					
1		•	Systems and Compu 511-9 2nd Edition (2	•	Manufacturing", Gro	over, M.P., Pearsor
Refe	rence Bo					
1			obotics by Ganesh I	•		
2		Engineering: An In , PHL Publications	tegrated Approach	by Klafter Richa	ard D., Chmielewski T	homas A., Negin
3	"Mecha	tronics", W. Boltor	n, Third Edition, Pea	rson Education		
Supp	lementa	ry Readings:				
Linl	ks:					
-		//nptel.ac.in/cou				
2			com/watch?v=t6pp			
3	3. <u>https:</u>	//archive.nptel.ac	in/courses/112/10	<u>)7/112107298/</u>		



			cond Year B. Tech. (Me	1				
Cour	rse Code	01MEMDL220	Course Name	Mechatron	ics			
	Teaching 9	cheme			Ev	aluation Sche	me	
L	T P	Credits			SE-I Marks	SE-II Marks	SEE Marks	
2		2			25	25	50	
	rse Objectiv							
01			o various concepts of g in Mechatronics.	f Mechatroni	cs and the ir	ntegration of	different	
02	to make students aware of the recent trends and practices in Mechatronics in manufacturing and service sector for productivity improvement and cost, time and human intervention reduction and comparison with equivalent traditional systems.							
	rse Outcom							
	1	· · · · · · · · · · · · · · · · · · ·	nts will be able to					
01	Demonst associate	•	linary scenario of Mecl	hatronics alon	g with basic	elements and	terms	
02	Describe	sensors, digital	circuits and signal cond	ditioning.				
03	_		litional and mechatron	Distinguish between traditional and mechatronics system and appreciate the current advances in Mechatronics.				
			Course C	Contents				
	nit I		< Introduction to Mecl	hatronics >			Hours	
Intro Mec	oduction to	o Mechatronics ystems, Measur		hatronics > onics, Advan ol systems, Mu	ultidisciplinar	ations and A y scenario, Ca	Applications se studies o	
Intro Mec Mec	oduction to	o Mechatronics ystems, Measur ystems like pick	Introduction to Meclas: What is Mechatre ement systems, Control	hatronics > onics, Advan ol systems, Mu r, handling sys	ultidisciplinar	ations and A y scenario, Ca om scales, DSL	Applications se studies o	
Intro Mec Mec Un Intro	oduction to hatronics s hatronics s it II oduction to oduction to	o Mechatronics ystems, Measure ystems like pick Digital logic, N	Introduction to Mecles: What is Mechatro ement systems, Control and place manipulator	hatronics > onics, Advan ol systems, Mu r, handling sys id Power > gates, Applic	ultidisciplinar tem, bathroo	ations and A y scenario, Ca om scales, DSL 4 ic gates, Boole	Applications se studies o R, etc. Hours ean Algebra	
Intro Mec Mec Un Intro Intro	oduction to hatronics s hatronics s it II oduction to oduction to	o Mechatronics ystems, Measure ystems like pick Digital logic, No hydraulics and	Introduction to Meclas: What is Mechatronement systems, Controlland place manipulator Digital Logic and Fluit umber systems, Logic	hatronics > onics, Advan of systems, Mu r, handling sys id Power > gates, Applica re, Advantage	ultidisciplinar tem, bathroo	ations and A y scenario, Ca om scales, DSL 4 ic gates, Book itions, ISO syr	Applications se studies o R, etc. Hours ean Algebra	
Intro Mec Mec Un Intro Intro com Uni Sens Limit	chatronics shatronics shatronics shatronics shatronics shatronics shatronics shatronics shatronics shatronics and duction to poduction to ponents, A it III sor definition to allow shatronics and definition to allow shatronics and definition to allow shatronics sha	o Mechatronics ystems, Measure ystems like pick  Digital logic, No hydraulics and pplications.  on and classifical	Introduction to Meclas: What is Mechatron ement systems, Control and place manipulator of the control of the	hatronics > onics, Advan ol systems, Mu r, handling sys id Power > gates, Applica re, Advantage tronics > minology, Recoolute encode	ultidisciplinar tem, bathroo ations of log es and limita ed switch, Inc rs, Tactile ser	ations and A y scenario, Ca om scales, DSL  4 ic gates, Book ations, ISO syr  6 ductive proxin	Applications se studies of R, etc.  Hours ean Algebra mbols, Basi  Hours nity sensors	
Intro Mec Mec Un Intro Intro Com Uni Sens Limit	chatronics shatronics shatronics shatronics shatronics shatronics shatronics shatronics shatronics shatronics and duction to poduction to ponents, A it III sor definition to allow shatronics and definition to allow shatronics and definition to allow shatronics sha	o Mechatronics ystems, Measure ystems like pick  Digital logic, No hydraulics and pplications.  on and classifical	Introduction to Meclas: What is Mechatronement systems, Controlland place manipulator of the controlland place manipulator of the controlland place manipulator of the controlland place of the c	hatronics > onics, Advan ol systems, Mu r, handling sys id Power > gates, Applica re, Advantage tronics > minology, Ree solute encode ensors, Selecti	ultidisciplinar tem, bathroo ations of log es and limita ed switch, Inc rs, Tactile ser	ations and A y scenario, Ca om scales, DSL  4 ic gates, Boole itions, ISO syr  6 ductive proxin asor, Potention	Applications se studies of R, etc.  Hours ean Algebra mbols, Basi  Hours nity sensors	
Unintro Unintro Unintro Unintro Unintro Com Unintro Co	chatronics schatronics schatro	Digital logic, No hydraulics and pplications.  In and classifications, Hall Effect sening process, Opining p	Introduction to Meclas: What is Mechatric ement systems, Control and place manipulator of the control of the	hatronics > onics, Advan ol systems, Mu r, handling sys id Power > gates, Applica re, Advantage tronics > minology, Ree solute encode ensors, Selectioning >	ultidisciplinar tem, bathroo ations of logi es and limita ed switch, Inc rs, Tactile ser on of sensors	ations and A y scenario, Ca om scales, DSL  4 ic gates, Boole itions, ISO syr  6 ductive proxin nsor, Potention 5.  4	Applications se studies of R, etc.  Hours ean Algebra mbols, Basi  Hours nity sensors meter, LVDT	
Intro Mec Mec Un Intro Intro Com Uni Sens Limit Capa Uni Signa	chatronics schatronics schatro	Digital logic, No hydraulics and pplications.  In and classifications, Hall Effect sening process, Opining p	Introduction to Meclas: What is Mechatrement systems, Control and place manipulator of Digital Logic and Fluit umber systems, Logic preumatics, Structured Sensors in Mechantion, Performance Termors, Incremental & absensor, Temperature secons of Signal Condition.	hatronics > onics, Advan ol systems, Mu r, handling sys id Power > gates, Applica re, Advantage tronics > minology, Rec solute encode ensors, Selectioning > overting ampli	ultidisciplinar tem, bathroo ations of logi es and limita ed switch, Inc rs, Tactile ser on of sensors	ations and A y scenario, Ca om scales, DSL  4 ic gates, Book ations, ISO syr  6 ductive proxin asor, Potention 5.  4 erting amplifie	Applications se studies of R, etc.  Hours ean Algebra mbols, Basinity sensors meter, LVD1  Hours	
Intro Mec Mec Un Intro Intro Com Uni Sens Limit Capa Uni Signa integ Un Anal	chatronics schatronics chatronics accurate schatronics characteristics and condition grating amplit V	Digital logic, No hydraulics and pplications.  On and classifical pneumatic sensors, Hall Effect solifier), Protectional converter (AE	Introduction to Meclas: What is Mechatre ement systems, Control and place manipulator of the control of the	hatronics > onics, Advan ol systems, Mu r, handling sys id Power > gates, Applica re, Advantage tronics > minology, Rec solute encode ensors, Selecti ning > verting ampli rfacing > converter (DA	altidisciplinar tem, bathroometem, bathroometem, bathroometem ations of logics and limitated switch, Incress, Tactile seron of sensors fier, non-invess.	ations and A y scenario, Ca om scales, DSL  4 ic gates, Book ations, ISO syr  6 ductive proxin asor, Potention s.  4 erting amplifie  4 and hold, Inter	Applications se studies of R, etc.  Hours ean Algebra mbols, Basin Hours nity sensors meter, LVDTHours er, summing Hours	



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Traditional Vs Mechatronics Design, Industry 4.0 – Definition, evolution, advantages and limitations, Industry 4.0 Technologies – Internet of Things and Cyber Physical System, Artificial Intelligence, Machine Learning and Big Data

Leaiiiii	g and big bata					
Texts B	Texts Books:					
1	Mechatronics, Venkatesh Naik, Sunstar Publisher, 2021					
2	N.C.Braga, Mechatronics Source Book, Cengage Learning					
3	Mechatronics: Integrated Mechanical Electronic System, Ramchandran Willey India					
Referer	nce Books:					
1	Mechatronics, W. Bolton, 6th Edition, Pearson Education, 2015, ISBN: 978-1-292-07668-3					
2	Mechatronics, N. P. Mahalik, TATA McGraw Hill Edu, 2017, ISBN: 978-0070483743					
3	Hydraulics and Pneumatics, Andrw Parr, Jaico Publication House, ISBN: 978-8172241896					
4	Quick Start Guide to Industry 4.0: One-stop reference guide for Industry 4.0, Kiran Kumar Pabbathi,					
4	Create space Independent Publishing Platform, May 2018, ISBN-10: 1718978618					

#### **Supplementary Readings:**

#### **Useful Links:**

- 1. https://www.youtube.com/watch?v=XIJJHyz\_ZG8
- 2. https://www.youtube.com/watch?v=PsBmuR33sMo
- 3. https://www.youtube.com/watch?v=NjYTzvAVozo
- 4. https://www.youtube.com/watch?v=TAIYC058w&list=PL\_hQO2hWfeKOp7v00Vl7dsIn2sAS5b9P5



				r B. Tech. (Mechanical) (Semester–IV)				
Cou	rse Code	01MEMDP2204	Course Name	Mechatronics Lab				
	Teachi	ng Scheme			Evaluation	on Scheme		
L	T	P Credits		CIE N	⁄larks	SEE Marks		
	2	2 1		5	0			
Cou	rse Objec	tives:						
01		oduce students to vai neering in Mechatror	•	echatronics and the int	egration o	f different branche		
02	service		ity improvement an	and practices in Mecha d cost, time and huma				
	rse Outco							
		the course, students						
01	Demon associa	•	ary scenario of Me	echatronics along with	n basic el	lements and term		
02	Describ	e sensors, digital circ	cuits and signal cond	itioning.				
03	Disting	Distinguish between traditional and mechatronics system and appreciate the current advances in						
	Mechai	tronics.						
			List of Exp	eriments				
1	Assignm	nent on Mechatronics	s systems and case s	tudies				
2	Assignn	nent on Digital Logic						
3	Introdu	ction to fluid power s	systems					
4	Introdu	ction to sensors and	sensor applications					
5	Assignn	nent on signal conditi	ioning					
6	Assignn	nent on Industry 4.0	Technologies – IoT a	nd CPS.				
7	Assignn	nent on AI and ML ap	plications in enginee	ering.				
8	Industri	al visit.						
Text	s Books:							
1	Mecha	tronics, Venkatesh N	aik, Sunstar Publishe	er, 2021				
2	N.C.Br	aga, Mechatronics So	ource Book, Cengage	Learning				
3	Mecha	tronics: Integrated M	1echanical Electronic	System, Ramchandrar	า Willey In	dia		
Refe	rence Bo	oks:						
1	Mecha	tronics, W. Bolton, 61	th Edition, Pearson E	ducation, 2015, ISBN:	978-1-292	-07668-3		
2	Mecha	tronics, N. P. Mahalik	k, TATA McGraw Hill	Edu, 2017, ISBN: 978-0	07048374	3		
3	Hydrau	lics and Pneumatics,	Andrw Parr, Jaico P	ublication House, ISBN:	: 978-8172	241896		
4	Quick S	Hydraulics and Pneumatics, Andrw Parr, Jaico Publication House, ISBN: 978-8172241896  Quick Start Guide to Industry 4.0: One-stop reference guide for Industry 4.0, Kiran Kumar Pabbathi,  Create space Independent Publishing Platform, May 2018, ISBN-10: 1718978618						



			d Year B. Tech. (Me				
Course	Code	01MEMDL2301	Course Name	Industrial I	Robotics		
T	eaching	Scheme			Ev	aluation Sche	me
L -	ГР	Credits			SE-I Marks	SE-II Marks	SEE Marks
2		2			25	25	50
Course							
		iarize robot structur	•			een different o	rives.
		op skills in performi			<u> </u>		
		op knowledge in the			S		
04   1	o unde	rstand Robot Progra	mming and Moderi	n Robotics.			
Course	Outcon	nes:					
At the	end of th	ne course, students	will be able to				
01 I	dentify	the components of	a robot and distingu	uish the types	of robot co	nfigurations	
02 (	Compar	e and choose drives	and grippers for ro	bots.			
03 (	Constru	ct a kinematic mode	l of a manipulator.				
04 l	Jnderst	and modern approa	ches and the basic <sub>l</sub>	programming	for Robotics	5.	
			Course Co	ntents			
Unit I		< Fund	amentals of Indust			4	Hours
		ns, Robot Anatomy, Criteria for selection, Robotic Control Systems: Drives,					
•		ne, Selection guidel			•		
		tial resolution, Accu		•		terrimiology in	inc stability
Unit I		,	< Robotic Grippe	· · · · · · · · · · · · · · · · · · ·		6	Hours
Gripper	s – Med	hanical Grippers, Pn	eumatic and Hydra	ulic Grippers	Magnetic G	rippers, Vacuu	ım Grinners
		nd Three Fingered (	•		_	• •	
	_	Force analysis of gr	• •		•		
Unit II		, ,	< Robot Kinemat				Hours
Forward	d Kinem	atics; Inverse Kinem	natics and Difference	ces. Forward	Kinematics a	and Reverse K	inematics of
		ith Two Degrees of					
Unit I\			ves and Control for			4	Hours
Drive -	Types of	f Drives, Types of tra	insmission systems	Actuators a	nd its salactiv	on while design	ning a robot
		l Systems: Types of (	•			_	illing a robot
Unit V		, , , , , , , , , , , , , , , , ,	< Robot Programm				Hours
					ا مرامعة ماميمة		
_	_	pproaches for robot De-palletizing.	, robot programmir	ig basics for s	impie tasks i	ike Pick and pi	ace, Sorting
Unit V		De-palletizing.	< Modern Roboti	cc >		1	Hours
		modern mobile rob			ninulators Au		
		cation of Al, New tre				atorioriious III	Julic Tobots
Texts B			and the second apart		-		
I CALS D		mation, Production	Systems and Com	nuter Integ	ated Manuf	acturing" Gr	nover M D
1			•			acturing, Oil	JUVCI, 1VI.P.
Pearson Education, ISBN: 81-7808-511-9 2nd Edition (2004)							
				<u> </u>			



	"Industrial Robotics, Technology, Programming and Applications", Groover, M.P.; Weiss, M.;
1	Nagel, R.N. and Odrey, N.G., McGraw Hill Intl. Edition., ISBN: 0-07-024989-X
2	"Mechatronics", W. Bolton, Third Edition, Pearson Education
3	Robot Technology Fundamentals", Keramas, James G, Thomson Learning –Delmar ISBN: 981-240-621-2,(1998)
Supple	mentary Readings:
Links	
1.	https://archive.nptel.ac.in/courses/112/105/112105249/
2.	https://www.youtube.com/watch?v=rbki4HR41-4
<b>3.</b>	https://www.youtube.com/watch?v=Lm2vDuL_gys



			Secon	d Year B. Tech. (Med	hanical) (Se	emester–V)	
Cour	se Coo	de	01MEMDP2302	Course Name	Industr	ial Robotics Lab	
	Tea	achin	g Scheme			Evaluatio	n Scheme
L	Т	Р	Credits			CIE Marks	SEE Marks
		2	1			50	
Cour	se Obj	ectiv	es:				
01	To fa	miliar	ize robot structure	s and their workspac	e and distir	nguish between differ	ent drives.
02	To de	evelop	skills in performir	g kinematic analysis	of robot ma	anipulator.	
03	To de	evelop	knowledge in the	Industrial application	s of robots	<b>5.</b>	
04	To ur	nderst	and Robot Progran	nming and Modern R	obotics.		
Cour	se Out	tcome	es:				
At th	e end	of the	e course, students	will be able to			
01	Ident	ify th	e components of a	robot and distinguish	the types	of robot configuration	ns
02	Comp	oare a	ind choose drives a	nd grippers for robot	S.		
03	Cons	truct	a kinematic model	of a manipulator.			
04	Unde	erstan	d modern approac	hes and the basic pro	gramming	for Robotics.	
				<u> </u>			
				List of Exper	iments		
1	Assig	nmer	nt on Industrial Rob	ots.			
2	Assig	nmer	nt on Robotic Gripp	ers.			
3	Assig	nmer	nt on Robotic Gripp	ers problems.			
4	Assig	nmer	nt on Robot kinema	tics.			
5	Assig	nmer	nt on Drives and Co	ntrol for Robotics.			
6	Robo	t Pro	gramming Exercise	S.			
7	Robo	t Pro	gramming Exercise	S.			
8	Robo	t Pro	gramming Exercise	S.			
9	Robo	t Pro	gramming Exercise	S.			
10	Assig	nmer	nt on Modern Robo	tics.			
Text	s Book	s:					
1	"Au	toma	tion, Production Sy	stems and Computer	Integrated	Manufacturing", Gro	oover, M.P.,
	Pea	rson E	Education, ISBN: 81	-7808-511-9 2nd Edit	ion (2004)		
Refe	rence	Book	s:				
1	"Aut	tomat	tion, Production Sy	stems and Computer	Integrated	Manufacturing", Gro	over, M.P., Pearson
	Edu	cation	ı, ISBN: 81-7808-51	.1-9 2nd Edition (200	4)		
2				otics by Ganesh Hego			
3			-	egrated Approach by	Klafter Ric	chard D., Chmielewsk	i Thomas A., Negin
<u> </u>			PHL Publications				
4				Third Edition, Pearso	n Education	n	
		ntary	Readings:				
Link	KS:						
1.	htt			<u>in/courses/112/105</u>			
2.				e.com/watch?v=rb			
3.		http	s://www.youtub	e.com/watch?v=Ln	12vDuL_9	gys	



_			nd Year B. Tech. (Me				
Cour	se Code	e 01MEMDL2303	Course Name	Control Sy	/stems		
	Teach	ing Scheme			Ev	aluation Sche	me
L	Т	P Credits			SE-I Marks	SE-II Marks	SEE Marks
2		2			25	25	50
		ectives:					
01		roduce students to va	·	ocess control	systems and	amalgamatio	n of different
	engineering branches in them.  To make students get introduced to and appreciate various controllers employed in process control.						
02							
03		ike students design, ar or various real life prol		uired, validati	e and implem	ient ladder pro	ograms using
Cour	se Outo	comes:					
At th	e end c	of the course, students	will be able to				
01		ss process control syst	· · · · ·				
02		wledge and appreciat	•				
03		n and communicate au		-	•		•
	indus	tries through selectior	n of appropriate com	nponents and	programmin	g instructions	•
			6 6				
			Course C				
Uni			troduction to Proce		N 4 = al =		Hours
		n, Feedback control supen Loop and Closed					Operationa
Uni		·	Exploring Control S		control system		Hours
				<u> </u>			
		n of control systems or er, Control system har	·				erтormance
Uni			< Arduino >				Hours
	_	crocontroller and mid dware and software, A	•				
Unit	t IV		< Raspberry P	i >		4	Hours
Limit	ations,	n, Difference between Raspberry Pi Genera mple programming us	ations, Applications	, Introduction			_
Uni	t V		< Introduction to	PLC >		5	Hours
disad	lvantag	n, Definition of PLC, es, Machine contro nt circuit, Majority circ	ol terminology, P	hysical com	ponents Vs.	. Program	_
Unit			< PLC Programm				Hours
	PLC c	omponents and other	•		_		-
instru		, PLC timer functions - , Internal relays.	- Types, Industrial a	pplications, P	LC control fui	nctions – Type	es, Industria



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2	Programmable logical controller, Reis Webb, Prentice Hall
3	Control System Engineering: R Anand Natarajan, P. Ramesh Babu, SciTech Publication
4	Handbooks for Arduino and Raspberry Pi
Referen	ice Books:
1	Mechatronics, W. Bolton, 6th Edition, Pearson Education, 2015, ISBN: 978-1-292-07668-3
2	Automatic Control Engineering: F.H. Raven (5th ed.), Tata McGraw Hill Publication.
3	Automatic Control Systems: B.C. Kuo, 7thEd, Willey India Ltd. / Prentice Hall Publication
4	Raspberry Pi and Python, Hans-Petter Halvorsen, 2021, The Technical Guy (halvorsen.blog)
5	Exploring Arduino, Jeremy Blum, John Wiley & Sons, Inc., 2013, ISBN: 978-1-118-54936-0.

#### **Supplementary Readings:**

#### **Useful links:**

- 1. https://www.youtube.com/watch?v=wrrbXM1YYeQ&list=PLXbLuD5WNA3KlJR5YnO3PLnSetrVzLuSw
- 2. <a href="https://www.youtube.com/watch?v=VGNVFWheeI4">https://www.youtube.com/watch?v=VGNVFWheeI4</a>
- 3. <a href="https://www.youtube.com/watch?v=s2AKMERnBhQ">https://www.youtube.com/watch?v=s2AKMERnBhQ</a>
- 4. <a href="https://www.youtube.com/watch?v=Y5NgUc\_dxlA">https://www.youtube.com/watch?v=Y5NgUc\_dxlA</a>



Course Code 01MEMDP2304		Course Name	Control Syst	Control Systems Lab						
		- Course Hamis	30111101070							
	Teaching Scheme					Evaluation Scheme				
L	T P	Credits			CIE Marks	SEE Marks				
	2	1			50					
	rse Objecti					t:t-d:ff				
01		ring branches in the	•	process control	systems and amaig	gamation of different				
02	_			eciate various c	controllers employe	ed in process control.				
03						adder programs using				
03		arious real life pro		equired, validat	e and implement is	ducer programs using				
Com	rse Outcor	•	Jiems.							
		he course, students	will be able to							
01		·		types, significar	nce and application	S.				
02	Discuss process control system components, types, significance and applications.  Acknowledge and appreciate controllers preferred in process control systems.									
03	Design and communicate automated solutions for economic, global and environmental problems fo									
	industries through selection of appropriate components and programming instruct									
				xperiments	1 0					
1	Assignment on Process control									
2	Assignment on Arduino									
3	Assignment on Raspberry Pi									
4	Introduction to PLC									
5	PLC programming for simple process control									
6	PLC programming based on timers									
7	PLC programming based on counters									
8	PLC programming using timers, counters and internal relays.									
Text	s Books:									
1	Programmable logical controller, Hackworth & Hackworth, Pearson Education									
2	Programmable logical controller, Reis Webb, Prentice Hall									
3	Control System Engineering: R Anand Natarajan, P. Ramesh Babu, SciTech Publication									
4		oks for Arduino and	d Raspberry Pi							
Refe	rence Boo									
1		ronics, W. Bolton, 6								
2		tic Control Enginee								
3		Automatic Control Systems: B.C. Kuo, 7thEd, Willey India Ltd. / Prentice Hall Publication								
4	Raspberry Pi and Python, Hans-Petter Halvorsen, 2021, The Technical Guy (halvorsen.blog) Exploring Arduino, Jeremy Blum, John Wiley & Sons, Inc., 2013, ISBN: 978-1-118-54936-0.									
5			Blum, John Wiley 8	⅓ Sons, Inc., 20	13, ISBN: 978-1-118	3-54936-0.				
		y Readings:								
	ul links:		10 10000	001: 1 5:11:	DEMANA OVER STATE	201 6				
		.youtube.com/wat			D5WNA3KIJR5YnO3	3PLnSetrVzLuSw				
	•	v.youtube.com/wat								
3. nt	tps://www	v.youtube.com/wat	:ch?v=s2AKMERnB :ch?v=Y5NgUc_dxl.							



		Se	cond Year	B. Tech. (Mechan	ical) (Semest	ter–VII)				
Course Code 01MDMDP2 Teaching Scheme		Course Name Cap		Capston	pstone Project Evaluation Scheme					
L	ТР	Credits				CIE Marks	SEE Marks			
	4	2				50				
Cou	se Objecti	ves:								
01	Apply engineering principles and methodologies to solve real-world problems.									
02	Collaborate effectively in interdisciplinary teams.									
03	Develop project management and time management skills.									
04	Communicate technical ideas effectively through oral presentations and written reports.									
05	Demonstrate creativity, innovation, and critical thinking in problem-solving.									
Cou	rse Outcon	nes:								
At th	e end of tl	ne course, stud	ents will be	able to						
01		strate the abiling strate the ability and propose		engineering prine solutions.	ciples and m	ethodologies to	analyze real-wor			
02	Work effectively in interdisciplinary teams, demonstrating collaboration, leadership, and communication skills to achieve project objectives.									
03		Demonstrate creativity, innovation, and critical thinking in problem-solving, exploring alternative solutions, and adapting strategies based on project constraints and feedback.								
04	1	Conceptualize, design, and develop a prototype solution, applying engineering principles, and iterative design methodologies to address identified problems effectively.								
05		nance of the p	_	alidation proceduion, iteratively re			• • • • • • • • • • • • • • • • • • • •			



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#### **Course Contents**

Capstone Project is a culmination of the student's undergraduate education, providing an opportunity to apply theoretical knowledge and practical skills to a real-world engineering problem. Students will work in teams to identify, analyze, design, and implement a solution, culminating in a final project presentation and documentation.

- Project Proposal and Planning
- Literature Review and Research
- Design and Development
- Documentation and Presentation
- Final Project Presentation and Evaluation

The group should submit the synopsis in following format

- i. Title of Project
- ii. Names of Students
- iii. Name of Guide
- iv. Relevance
- v. Present Theory and Practices
- vi. Proposed work
- vii. Expenditure
- viii. References
- 2. The synopsis shall be signed by the each student in the group, approved by the guide and endorsed by the Head of the Department
- 3. Presentation: The group has to make a presentation in front of the Faculty members of department at the end of semester.

#### **Project Phase I Report Format:**

Project Phase I report should be of 25 to 30 pages (typed on A4 size sheets). For standardization of the project phase I reports the following format should be strictly followed.

- 1. Page Size: Trimmed A4
- 2. Top Margin: 1.00 Inch
- 3. Bottom Margin: 1.32 Inches
- 4. Left Margin: 1.5 Inches
- 5. Right Margin: 1.0 Inch
- 6. Para Text: Times New Roman 12 Point. Font
- 7. Line Spacing: 1.5 Lines
- 8. Page Numbers: Right Aligned at Footer. Font 12 Point. Times New Roman
- 9. Headings: Times New Roman, 14 Point, Bold Face
- 10. References: References should have the following format

For Books: "Title of Book", Authors, Publisher, Edition

For Papers: "Title of Paper, Authors, Journal/Conference Details, Year

#### **Important Notes:**

- > Project group should continue maintaining a diary for project and should write (a) Book referred (b) Company visited (c) Person contacted (d) Computer work done (e) Paper referred (f) Creative thinking.
- > The Diary along with Project Phase I Report shall be assessed at the time of oral examination
- One copy of the report should be submitted to Institute/ Department, One copy to Guide and one copy should remain with each student of the project group.