



COURSE HANDOUT

Part-A

PROGRAM : B.Tech. , VII-Sem., EIE

ACADEMIC YEAR : 2019-20

COURSE NAME & CODE: S340 – PLC & SCADA

STRUCTURE : 3-1-0

COURSE CREDITS : 3

COURSE INSTRUCTOR : Dr. RAMBABU

BUSI COURSE COORDINATOR: R.ANJANEYULU NAIK

PRE-REQUISITE: None

COURSE EDUCATIONAL OBJECTIVES (CEOs): In this course student can able to learn, how to control field instruments in an industry using PLC programming with SCADA interfaces.

COURSE OUTCOMES (COs): After the completion of the course, students should be able to:

CO1: classify the basic PLC operations and its selection criteria.

CO2: create and test ladder logics for different applications.

CO3: compare between a SCADA and PLC system.

CO4: distinguish between SCADA hardware and firmware.

CO5: list the various types of SCADA protocols.

COURSE ARTICULATION MATRIX (Correlation between COs& POs, PSOs):

Course Code	COs	Program Outcomes												PSOs		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	
S340	1	1	1	1		1										3
	2	1	3	3		1							2			3
	3	1	2	2		1										
	4	1	1	1		1							2			
	5	1	-	-		1										
		1 = Slightly (low)				2 = Moderate (medium)				3-Substantially(High)						

BOS APPROVED TEXT BOOKS:

- T1** John W Webb, Ronald A. Reis, “Programmable Logic Controllers: Principles and Application”, Pearson Education, 5th Edition, 2009.
- T2** David Bailey, Edwin Wright, “Practical SCADA for Industry”, Newnes, An Imprint of Elsevier, 2003.

BOS APPROVED REFERENCE BOOKS:

- R1** Ronald L. Krutz “Securing SCADA system”, Wiley publishing, 2006 of Elsevier, 2004.
- R2** John D.Hackworth, Frederick D.Hackworth Jr., “Programmable Logic Controllers Programming Methods and applications”, 2003
- R3** Gordan Clark, Deem Reynders, “Practical Modem SCADA Protocols Newnes An imprint
- R4** Gary Dunning, “Introduction to Programmable Logic Controllers”, Thomson, 2nd Edition, 2001

Part-B**COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I INTRODUCTION TO PLC**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Definition & History of PLC	1	17-06-2019		1	CO1	T1	
2.	Overall PLC system	1	18-06-2019		1	CO1	T1	
3.	PLC Input modules	1	21-06-2019		1	CO1	T1	
4.	TUTORIAL-1	1	22-06-2019		3			
5.	CPU & programmer/monitors	1	24-06-2019		1	CO1	T1	
6.	solid state memory	1	25-06-2019		1	CO1	T1	
7.	processor, Input module (Interfaces)	1	28-06-2019		1	CO1	T1	
8.	Power supplies	1	29-06-2019		1	CO1	T1	
9.	PLC advantages & disadvantages	1	01-07-2019		1	CO1	T1	
10.	selection criteria for PLC	1	02-07-2019		1	CO1	T1	
No. of classes required to complete UNIT-I		10			No. of classes taken:			

UNIT-II: PROGRAMMING OF PLC

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
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11.	Programming equipment	1	05-07-2019		1	CO2	T1		
12.	proper construction of PLC ladder diagram	1	06-07-2019		1	CO2	T1		
13.	Basic components & their symbols in ladder diagram	1	08-07-2018		1	CO2	T1		
14.	Fundamentals of ladder diagram	1	09-07-2019		1	CO2	T1		
15.	TUTORIAL-2	1	12-07-2019		3				
16.	Boolean logic & relay logic	1	15-07-2019		1	CO2	T1		
17.	Analysis of rungs.	1	16-07-2019		1	CO2	T1		
18.	Input ON/OFF switching devices	1	19-07-2019		1	CO2	T1		
19.	Input analog devices	1	20-07-2019		1	CO2	T1		
20.	Output ON/OFF devices	1	22-07-2019		1	CO2	T1		
21.	Output analog devices	1	23-07-2019		1	CO2	T1		
22.	Programming ON/OFF Inputs to produce ON/OFF outputs.	1	26-07-2019		3	CO2	T1		
23.	PLC timer function	1	27-07-2019		1	CO2	T1		
24.	PLC Counter functions	1	29-07-2019		1	CO2	T1		
No. of classes required to complete UNIT-II		14			No. of classes taken:				

UNIT-III: INTRODUCTION TO SCADA

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
25.	Introduction and brief history of SCADA	1	30-07-2019		1	CO3	T2	
26.	Fundamental principles of modern SCADA systems	1	02-08-2019		1	CO3	T2	
27.	SCADA hardware	1	03-08-2019		1	CO3	T2	
28.	SCADA software	1	05-08-2019		1	CO3	T2	
29.	TUTORIAL-3	1	06-08-2019		3		T2	
30.	Landlines for SCADA	1	09-08-2019		1	CO3	T2	
31.	Modem use in SCADA system	1	19-08-2019		1	CO3	T2	
32.	computer sites and troubleshooting	1	20-08-2019		1	CO3	T2	

No. of classes required to complete UNIT-III	08	No. of classes taken:
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UNIT-IV: SCADA SYSTEM, HARDWARE AND FIRMWARE

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
33.	System implementation	1	23-08-2019		1	CO4	T2	
34.	Comparison of terms SCADA	1	26-08-2019		1	CO4	T2	
35.	Distributed Control System (DCS)	1	27-08-2019		1	CO4	T2	
36.	PLC and smart instrument	1	30-08-2019		1	CO4	T2	
37.	Considerations and benefits of SCADA system	1	31-08-2019		3	CO4	T2	
38.	Remote Terminal Units(RTU)s: Control	1	03-09-2019		1	CO4	T2	
39.	Processor	1	06-09-2019		1	CO4	T2	
40.	Analog input& output module	1	07-09-2019		1	CO4	T2	
41.	Digital input &output module	1	09-09-2019		1	CO4	T2	
42.	TUTORIAL-4	1	13-09-2019		3		T2	
43.	Communication interfaces	1	16-09-2019		1	CO4	T2	
44.	Power supply module for RTU	1	17-09-2019		1	CO4	T2	
45.	Application programme	1	20-09-2019		1	CO4	T2	
46.	PLC used as RTUs, Master station	1	21-09-2019		1	CO4	T2	
47.	System reliability and availability	1	23-09-2019		1	CO4	T2	
48.	Communication architecture, philosophies	1	24-09-2019		1	CO4	T2	
No. of classes required to complete UNIT-IV		16				No. of classes taken:		

UNIT-V: THE EVOLUTION OF SCADA PROTOCOLS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
49.	Overview of open system interconnection (OSI) Model	1	27-09-2019		1	CO5	T2	
50.	Functions of OSI Model Layers, OSI Protocols	1	28-09-2019		1	CO5	T2	

51.	Functions of Transmission control protocol	1	30-09-2019		1	CO5	T2
52.	Internet protocol(TC/IP)	1	01-10-2019		1	CO5	T2
53.	TUTORIAL-5	1	04-10-2019		3	CO5	T2
54.	DNP3 protocol	1	05-10-2019		1	CO5	T2
55.	IEC61850 layered architecture	1	07-10-2019		1	CO5	T2
56.	CIP protocol, Device Net, Control Net	1	11-10-2019		1	CO5	T2
57.	Ethernet/IP	1	12-10-2019		1	CO5	T2
58.	Flexible Function Block process (FFB)	1	14-10-2019		1	CO5	T2
59.	Process Field bus (Profibus)	1	15-10-2019		1	CO5	T2
60.	The security Implications of SCADA protocols	1	18-10-2019		1	CO5	T2
No. of classes required to complete UNIT-V		12			No. of classes taken:		

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign
61.	PLC Interview Question and various projects	1	30-09-2019		1,6			

Teaching Learning Methods

TLM1	Chalk and Talk	TLM4	Demonstration (Lab/Field Visit)
TLM2	PPT	TLM5	ICT (NPTEL/Swayam Prabha/MOOCs)
TLM3	Tutorial	TLM6	Group Discussion/Project

Part - C

EVALUATION PROCESS:

Evaluation Task	COs	Marks
Assignment/Quiz – 1	1	A1=5
Assignment/Quiz – 2	2	A2=5
I-Mid Examination	1,2	B1=20
Assignment/Quiz – 3	3	A3=5
Assignment/Quiz – 4	4	A4=5
Assignment/Quiz – 5	5	A5=5
II-Mid Examination	3,4,5	B2=20
Evaluation of Assignment/Quiz Marks: $A=(A1+A2+A3+A4+A5)/5$	1,2,3,4,5	A=5

Evaluation of Mid Marks: $B=75\%$ of $\text{Max}(B1,B2)+25\%$ of $\text{Min}(B1,B2)$	1,2,3,4,5	B=20
Cumulative Internal Examination : A+B	1,2,3,4,5	A+B=25
Semester End Examinations	1,2,3,4,5	C=75
Total Marks: A+B+C	1,2,3,4,5	100

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

Electronics & Instrumentation Engineering graduates are expected to attain the following program educational objectives (PEOs) within a period of 3-5 years after graduation. Our graduates will:

PEO1: Successfully utilize engineering and non-engineering principles for design and analysis as needed in their field

PEO2: Become a life-long learner through the successful completion of advanced degree(s), continuing education, or other professional development.

PEO3: Exhibit effective communication, teamwork, leadership skills and ethical behavior as per the standard practice in the workplace

PROGRAM OUTCOMES

Engineering Graduates will be able to:

- 1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- 6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs):

After completion of programme, Graduates will be able to

PSO1-Acquire the ability to explore the design, installation & operation of the basic instrumentation system used in industrial environments and calibrate the process instruments.

PSO2- Apply appropriate modern Engineering hardware and software tools like PLC, LABVIEW, MATLAB in order to implement and evaluate in process control and instrumentation system along with safety measures that enables him/her to work effectively as an individual and in a multidisciplinary team.

Course Instructor	Course Coordinator	Module Coordinator	HOD



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DEPARTMENT OF ELECTRONICS & INSTRUMENTATION ENGINEERING

COURSE HANDOUT

Part-A

PROGRAM	: B.Tech. VII-Sem., EIE
ACADEMIC YEAR	: 2019-20
COURSE NAME & CODE	: Nanotechnology – S319
L-T-P STRUCTURE	: 3-1-0
COURSE CREDITS	: 3
COURSE INSTRUCTOR	: Dr .T. Satyanarayana
COURSE COORDINATOR	: Dr .T. Satyanarayana

PRE-REQUISITE: Engineering Physics, Electronic Devices and Circuits

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course will enable the student to learn about fundamentals of nanotechnology, size dependence of properties, synthesis approaches of nanomaterials, details of characterization instruments, quantum nanostructures, carbon nanotubes (CNTs), micro/nanoscale machines and devices.

COURSE OUTCOMES (CO)

CO1: Acquire basic understanding on advanced materials and properties for technological applications.

CO2: Describe the basic science behind the properties of nanomaterials and principles involved in experimental techniques for studying nanomaterials.

CO3: Familiar with fabrication techniques of quantum nanostructures and nanomachines.

CO4: Identify current nanotechnology solutions for design, fabrication and characterization.

CO5: Realize the basics of instrumentation for nanoscale items, measurement and analysis.

COURSE ARTICULATION MATRIX (Correlation between COs&POs,PSOs):

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	1	2	2	-	-	-	-	-	-	-	-	1	1	-	-
CO 2	2	1	1	-	-	-	-	-	-	-	-	2	1	2	-
CO 3	2	2	1	-	-	-	-	-	-	-	-	1	1	-	-
CO 4	1	2	2	-	1	-	-	-	-	-	-	1	2	2	-
CO 5	3	1	2	-	-	-	-	-	-	-	-	1	1	-	-

Note: Enter Correlation Levels **1** or **2** or **3**. If there is no correlation, put ‘-’
1- Slight (Low), **2** – Moderate (Medium), **3** - Substantial (High).

BOS APPROVED TEXT BOOKS:

T1 Charles P. Poole, Frank J. Owens, "Introduction to Nanotechnology", Wiley Inter Science, 2003.

T2 Mark A. Ratner, Daniel Ratner, "Nanotechnology: A gentle introduction to the next Big Idea", Prentice Hall P7R:1st Edition, 2002.

BOS APPROVED REFERENCE BOOKS:

R1 T. Pradeep, "Nano: The Essentials, Understanding of Nanoscience and Nanotechnology," Tata McGraw-Hill, 2007.

R2 KarkareManasi, "Nanotechnology Fundamentals and Applications" I.K. International, 2008.

Part-B**COURSE DELIVERY PLAN (LESSON PLAN): Section-A****UNIT-I: INTRODUCTION TO NANOTECHNOLOGY**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Importance of multidisciplinary course Nanotechnology and discussion about CEOs, COs, POs & PSOs	1	19-06-2019		TLM 1	CO1	T1, R2	
2.	Definition of Nano-Science and Nano Technology, Applications of Nano-Technology.	1	20-06-2019		TLM 2	CO1	T1, R2	
3.	Introduction to Physics of Solid State: Structure: Size dependence of properties	1	21-06-2019		TLM 2	CO1	T1, R2	
4.	Crystal structures, face centred cubic nanoparticles	1	22-06-2019		TLM 1	CO1	T1, R2	
5.	TUTORIAL-1	1	26-06-2019		TLM 3	CO1	T1, R2	
6.	Tetrahedrally bounded semiconductor structures	1	27-06-2019		TLM 1	CO1	T1, R2	
7.	Lattice vibrations	1	28-06-2019		TLM 1	CO1	T1, R2	
8.	Energy Bands: Insulators, semiconductor and conductors	1	29-06-2019		TLM 1	CO1	T1, R2	
9.	TUTORIAL-2	1	03-07-2019		TLM 3	CO1	T1, R2	
10.	Energy bands and gaps of semiconductors	1	04-07-2019		TLM 1	CO1	T1, R2	
11.	Reciprocal space Effective masses	1	05-07-2019		TLM 2	CO1	T1, R2	
12.	Fermi Surfaces	1	06-07-2019		TLM 2	CO1	T1, R2	
13.	Assignment/Test/Quiz-1	1	10-07-2019					
No. of classes required to complete UNIT-I					13	No. of classes taken:		

UNIT-II: SYNTHESIS METHODS & METHODS OF MEASURING PROPERTIES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
14.	Introduction, Various nanomaterial synthesis approaches	1	11-07-2019		TLM 1	CO2	T1, R2	
15.	RF plasma, Sputtering	1	12-07-2019		TLM 1	CO2	T1, R2	
16.	TUTORIAL-3	1	17-07-2019		TLM 3	CO2	T1, R2	
17.	Chemical methods, Thermolysis	1	18-07-2019		TLM 1	CO2	T1, R2	
18.	Pulsed Laser Methods	1	19-07-2019		TLM 1	CO2	T1, R2	
19.	Structure: Crystallography	1	20-07-2019		TLM 2	CO2	T1, R2	
20.	TUTORIAL-4	1	24-07-2019		TLM 3	CO2	T1, R2	
21.	Particle size determination, Surface structure	1	25-07-2019		TLM 1	CO2	T1, R2	
22.	Microscopy: Scanning Probe Microscopy (SPM)	1	26-07-2019		TLM 2	CO2	T1, R2	
23.	Atomic Force Microscopy (AFM), Field Ion Microscopy (FIM)	1	27-07-2019		TLM 1	CO2	T1, R2	
24.	TUTORIAL-5	1	31-07-2019		TLM 3	CO2	T1, R2	
25.	Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM)	1	01-08-2019		TLM 1	CO2	T1, R2	
26.	Spectroscopy: Infrared & Raman Spectroscopy	1	02-08-2019		TLM 2	CO2	T1, R2	
27.	X-ray Spectroscopy, Magnetic resonance	1	03-08-2019		TLM 2	CO2	T1, R2	
28.	TUTORIAL-6	1	07-08-2019		TLM 3	CO2	T1, R2	
29.	Luminescence, Vibrational Spectroscopy	1	08-08-2019		TLM 1	CO2	T1, R2	
30.	Assignment/Test/Quiz -2	1	09-08-2019					
	No. of classes required to complete UNIT-II				16	No. of classes taken		
I Mid Exams		12-08-2019 to 17-08-2019						

UNIT-III: CARBON NANOSTRUCTURES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
31.	Carbon molecules, Nature of the carbon bond	1	21-08-2019		TLM 1	CO3	T1, R2	
32.	New carbon structures, Carbon nanotubes	1	22-08-2019		TLM 1	CO3	T1, R2	
33.	Fabrication of CNTs	1	23-08-2019		TLM 2	CO3	T1, R2	
34.	TUTORIAL-7	1	28-08-2019		TLM 3	CO3	T1, R2	
35.	Types of CNTs	1	29-08-2019		TLM 2	CO3	T1, R2	
36.	Electrical, vibrational & mechanical properties	1	30-08-2019		TLM 2	CO3	T1, R2	
37.	Applications of carbon nanotubes: computers & Fuel Cells	1	31-08-2019		TLM 1	CO3	T1, R2	

38.	TUTORIAL-8	1	04-09-2019		TLM 3	C03	T1, R2	
39.	Chemical sensors	1	05-09-2019		TLM 1	C03	T1, R2	
40.	Assignment/Test/Quiz -3	1	06-09-2019					
	No. of classes required to complete UNIT-III				10	No. of classes taken:		

UNIT-IV: QUANTUM WELLS, WIRES AND DOTS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
41.	Preparation of quantum nanostructures, Size and dimensionality effects	1	07-09-2019		TLM 2	C04	T1, R2	
42.	TUTORIAL-9	1	11-09-2019		TLM 3	C04	T1, R2	
43.	Size effects, conduction electrons and dimensionality	1	12-09-2019		TLM 1	C04	T1, R2	
44.	Fermi gas and density of states	1	13-09-2019		TLM 2	C04	T1, R3	
45.	TUTORIAL-10	1	18-09-2019		TLM 3	C04	T1, R3	
46.	Potential wells	1	19-09-2019		TLM 2	C04	T1, R3	
47.	Particle confinement, Properties dependent on density of states	1	20-09-2019		TLM 2	C04	T1, R3	
48.	Excitons, Single electron tunneling	1	21-09-2019		TLM 1	C04	T1, R2	
49.	TUTORIAL-11	1	25-09-2019		TLM 3	C04	T1, R2	
50.	Applications: Quantum dot lasers, Infrared detectors	1	26-09-2019		TLM 1	C04	T1, R2	
51.	Assignment/Test/Quiz-4	1	27-09-2019					
	No. of classes required to complete UNIT-IV				11	No. of classes taken:		

UNIT-V: NANOMACHINES AND NANODEVICES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
52.	MEMS & Its characteristics	1	28-09-2019		TLM 1	C05	T1, R2	
53.	TUTORIAL-12	1	03-10-2019		TLM 3	C05	T1, R2	
54.	Nano-electro-mechanical systems (NEMS)	1	04-10-2019		TLM 1	C05	T1, R2	
55.	Fabrication techniques	1	05-10-2019		TLM 2	C05	T1, R2	
56.	TUTORIAL-13	1	09-10-2019		TLM 3	C05	T1, R2	
57.	Nanodevices and nanomachines, Molecular and	1	10-10-2019		TLM 2	C05	T1, R2	

	supramolecular switches							
58.	Revision	1	11-10-2019		TLM 1	C05	T1, R2	
59.	Revision	1	12-10-2019		TLM 2	C05	T1, R2	
60.	TUTORIAL-14		16-10-2019		TLM 3	C05	T1, R2	
61.	Revision		17-10-2019		TLM 2	C05	T1, R2	
62.	Assignment/Test/Quiz-5		18-10-2019					
	No. of classes required to complete UNIT-V				08	No. of classes taken:		
	II Mid Exams				21-10-2019 to 26-10-2019			

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Design of MEMS using COMSOL software tool	1	19-10-2019		TLM4	C01		

Teaching Learning Methods			
TLM1	Chalk and Talk	TLM4	Demonstration (Lab/Field Visit)
TLM2	PPT	TLM5	ICT (NPTEL/SwayamPrabha/MOOCs)
TLM3	Tutorial	TLM6	Group Discussion/Project

Part - C

EVALUATION PROCESS:

Evaluation Task	COs	Marks
Assignment/Quiz - 1	1	A1=5
Assignment/Quiz - 2	2	A2=5
I-Mid Examination	1,2	B1=20
Assignment/Quiz - 3	3	A3=5
Assignment/Quiz - 4	4	A4=5
Assignment/Quiz - 5	5	A5=5
II-Mid Examination	3,4,5	B2=20
Evaluation of Assignment/Quiz Marks: $A=(A1+A2+A3+A4+A5)/5$	1,2,3,4,5	A=5
Evaluation of Mid Marks: $B=75\% \text{ of Max}(B1,B2)+25\% \text{ of Min}(B1,B2)$	1,2,3,4,5	B=20
Cumulative Internal Examination : A+B	1,2,3,4,5	A+B=25
Semester End Examinations	1,2,3,4,5	C=75
Total Marks: A+B+C	1,2,3,4,5	100

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

1. Successfully utilize engineering and non-engineering principles for design and analysis as needed by their field.
2. life-long learner through the successful completion of advanced degree(s), continuing education, or other professional development
3. Exhibit effective communication, teamwork, leadership skills and ethical behaviour as standard practice in the workplace

Programme Outcomes (POs)

- 1 **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to solve complex engineering problems.
- 2 **Problem analysis:** Identify, formulate, review research literature and analyze complex engineering problems for drawing substantiated conclusions by using fundamental principles of mathematics, natural sciences, and engineering sciences.
- 3 **Design/development of solutions:** Design solutions for complex engineering problems by designing system components or processes that meet the specified needs with appropriate consideration for public health and safety, and the cultural, societal, and environmental considerations.
- 4 **Conduct investigations of complex problems:** Use research-based knowledge and research methods, including design of experiments, analysis and interpretation of data; and synthesize information to provide valid conclusions.
- 5 **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling to complex engineering activities with an understanding of their limitations.
- 6 **The engineer and society:** Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
- 7 **Environment and sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8 **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and the norms of engineering practice.
- 9 **Individual and team work:** Function effectively as an individual, and as member or a leader in diverse teams, and in multidisciplinary settings.
- 10 **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 11 **Project management and finance:** Demonstrate the knowledge and understanding of engineering and management principles; and apply these to one's own work, as a member and leader in a team to manage projects in multidisciplinary environments.
- 12 **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme-specific Outcomes (PSOs)

- 1 Acquire the ability to explore the design, installation & operation of the basic instrumentation system used in industrial environments as well as calibrate the process instruments.
- 2 Apply appropriate modern hardware and software tools like PLC, LABVIEW, and MATLAB in order to implement and evaluate process control and instrumentation systems along with the safety measures that enable him/her to work effectively as an individual or part of a multidisciplinary team.

Dr.T. Satyanarayana	Dr.T. Satyanarayana		
Course Instructor	Course Coordinator	Module Coordinator	HOD



COURSE HANDOUT

Part-A

PROGRAM	: B.Tech, VII-Sem, EIE R-14
ACADEMIC YEAR	: 2019-20
COURSE NAME & CODE	: VLSI DESIGN -S419
L-T-P STRUCTURE	: 3-1-0
COURSE CREDITS	: 3
COURSE INSTRUCTOR	: D.VENKATA LAKSHMI
COURSE COORDINATOR	: K.RANI RUDRAMA
PRE-REQUISITE	: IC & APPLICATIONS

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course provides the knowledge on IC Fabrication Technologies and gives a complete idea about combinational and sequential sub system CMOS circuit designs used in VLSI Design. The course also gives the complete information regarding design tools and CMOS testing techniques.

COURSE OUTCOMES (COs): After the completion of the course, students should be able to:

- CO1:** Interpret the fabrication steps and manufacturing technologies used in IC's.
- CO2:** Apply the MOS, CMOS logic gates using stick, layout diagrams.
- CO3:** Justify the Sheet resistance, capacitance and delay for MOS logics.
- CO4:** Illustrate the influence of wires/interconnects on VLSI circuit performance
- CO5:** Identify the knowledge on different design tools and CMOS testing

COURSE ARTICULATION MATRIX (Correlation between COs& POs, PSOs):

Course Code	COs	Programme Outcomes												PSOs		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	
S419	1	2													1	
	2	3	2	1											2	
	3	3	3	2											2	
	4	2	2												2	
	5	3	3												2	
		1 = Slightly (low)				2 = Moderate (medium)				3-Substantially(High)						

BOS APPROVED TEXT BOOKS:

1. Kamran Eshraghian, Eshraghian Douglas and A.Pucknell, Essentials of VLSI circuits and systems, PHI Publishers, 2005.
2. Neil.H.E.Weste and Kamaran Eshraghian, Principles of CMOS VLSI Design (2/e), Pearson Education Publishers, 3rdEdition.

BOS APPROVED REFERENCE BOOKS:

1. John .P. Uyemura, Introduction to VLSI Circuits and Systems, JohnWiley Publishers.
2. M.SZE, VLSI Technology,2ndEdition, TMH Publishers.

Part-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I : IC Fabrication Technology

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
2.	Introduction to Silicon Semiconductor Technology	1	17-06-2019		TLM1	CO1	T1	
3.	Semiconductor Technology	1	18-06-2019		TLM1	CO1	T1	
4.	NMOS fabrication	1	20-06-2019		TLM1	CO1	T1	
5.	CMOS fabrication	1	21-06-2019		TLM1	CO1	T1	
6.	BI-CMOS technology	1	24-06-2019		TLM1	CO1	T1	
7.	TUTORIAL-1	1	25-06-2019		TLM3	CO1		
8.	Comparison	1	27-06-2019		TLM1	CO1	T1	
9.	Electrical properties of MOS circuits	1	28-06-2019		TLM1	CO1	T1	
10.	Electrical properties of MOS circuits	1	01-07-2019		TLM1	CO1	T1	
11.	Electrical properties of MOS circuits	1	02-07-2019		TLM1	CO1	T1	
12.	TUTORIAL-2	1	04-07-2019		TLM3	CO1		
13.	Trans & Output conductance	1	05-07-2019		TLM1	CO1	T1	
14.	Figure of merit & pass transistor	1	08-07-2019		TLM1	CO1	T1	
15.	NMOS inverter & P.U to P.D ratio	1	09-07-2019		TLM1	CO1	T1	
16.	scaling factors - MOS devices	1	11-07-2019		TLM1	CO1	T1	
17.	TUTORIAL-3	1	12-07-2019		TLM3	CO1		
18.	CMOS inverter Latch up in CMOS circuits	1	15-07-2019		TLM1	CO1	T1	
19.	Revision	1	16-07-2019		TLM1	CO1	T1	
No. of classes required		18			No. of classes taken:			

to complete UNIT-I		
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UNIT-II : VLSI CIRCUIT DESIGN PROCESS

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
20.	VLSI Design flow & MOS layers	1	18-07-2019		TLM1	CO2	T1	
21.	Stick diagrams- MOS layers	1	19-07-2019		TLM1,2	CO2	T1	
22.	NMOS design style	1	22-07-2019		TLM1	CO2	T1	
23.	CMOS design style	1	23-07-2019		TLM1	CO2	T1	
24.	TUTORIAL-4	1	25-07-2019		TLM3	CO2		
25.	Lambda- based design rule	1	26-07-2019		TLM1	CO2	T1	
26.	Design rules for contact cuts, CMOS lambda based design rules	1	29-07-2019		TLM1	CO2	T1	
27.	Layout diagrams for NMOS and CMOS inverters and logic gates	1	30-07-2019		TLM1	CO2	T1	
28.	Concepts of sheet resistance and standard unit of capacitance	1	01-08-2019		TLM1	CO2	T1	
29.	TUTORIAL-5	1	02-08-2019		TLM3	CO2		
30.	Area capacitance & Inverter delays	1	05-08-2019		TLM1	CO2	T1	
31.	Cascaded inverters of drivers	1	06-08-2019		TLM1	CO2	T1	
32.	Revision	1	08-08-2019		TLM1	CO2		
No. of classes required to complete UNIT-II		13	No. of classes taken:					

UNIT-III : SUBSYSTEMS DESIGN

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
33.	Introduction to Sub system design flow	1	09-08-2019		TLM1	CO3	T1	
34.	Adders- single bit adder schematic	1	19-08-2019		TLM1	CO3	T1	

35.	Adder/ Subtractor	1	20-08-2019		TLM1	CO3	T1	
36.	Carry look ahead adder, Carry save adders	1	22-08-2019		TLM1	CO3	T1	
37.	TUTORIAL-6	1	26-08-2019		TLM3	CO3		
38.	4x4array multiplier	1	27-08-2019		TLM1	CO3	T1	
39.	Modified Booth's multiplier, serial/parallel multiplier	1	29-08-2019		TLM1	CO3	T1	
40.	Shifters- design of 4x4 barrel shifter	1	30-08-2019		TLM1	CO3	T1	
41.	Parity generator using XOR gates	1	02-09-2019		TLM1	CO3	T1	
42.	XNOR based Comparator circuit	1	03-09-2019		TLM1	CO3	T1	
43.	TUTORIAL-7	1	05-09-2019		TLM3	CO3		
44.	Zero/One Detector	1	06-09-2019		TLM1	CO3	T1	
45.	synchronous up/down counters	1	09-09-2019		TLM1	CO3	T1	
46.	Shift registers	1	12-09-2019		TLM1	CO3	T1	
47.	REVISION	1	13-09-2019					
No. of classes required to complete UNIT-III		15			No. of classes taken:			

UNIT-IV : SYSTEM DESIGN AND DESIGN METHODS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
48.	CMOS design methods	1	16-09-2019		TLM1	CO4	T2	
49.	structured design strategies Hierarchy, regularity	1	17-09-2019		TLM1	CO4	T2	
50.	TUTORIAL-8	1	19-09-2019		TLM3	CO4	T2	
51.	Behavioral RTL synthesis	1	20-09-2019		TLM1	CO4	T2	
52.	Structural to layout synthesis	1	23-09-2019		TLM1	CO4	T2	
53.	Placement and routing	1	24-09-2019		TLM1	CO4	T2	
54.	HDL , schematic, layout design	1	26-09-2019		TLM1	CO4	T2	

55.	TUTORIAL-9	1	27-09-2019		TLM3	CO4	T2	
56.	Design Verification Tools	1	30-09-2019		TLM1	CO4	T2	
57.	Revision	1	01-10-2019		TLM1	CO4		
No. of classes required to complete UNIT-IV		10			No. of classes taken:			

UNIT-V : CMOS TESTING

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
58.	Need for testing-functionality & Manufacturing tests	1	03-10-2019		TLM1	CO5	T2	
59.	Fault models & Observability	1	04-10-2019		TLM1	CO5	T2	
60.	TUTORIAL-10	1	07-10-2019		TLM3	CO5	T2	
61.	Controllability & fault coverage	1	10-10-2019		TLM1	CO5	T2	
62.	Delay fault testing, statistical Fault analysis, Fault sampling	1	11-10-2019		TLM1	CO5	T2	
63.	Improved testability	1	14-10-2019		TLM1	CO5	T2	
64.	TUTORIAL-11	1	15-10-2019		TLM3	CO5	T2	
65.	Revision	1	17-10-2019					
No. of classes required to complete UNIT-V		08			No. of classes taken:			

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign
66.	SUB-MICRON VLSI	1	18-10-2019				R1	
67.	IC using Nano meter sized transistor	1	19-10-2019				R1	

Teaching Learning Methods			
TLM1	Chalk and Talk	TLM4	Demonstration (Lab/Field Visit)
TLM2	PPT	TLM5	ICT (NPTEL/Swayam Prabha/MOOCs)
TLM3	Tutorial	TLM6	Group Discussion/Project

Part - C

EVALUATION PROCESS:

Evaluation Task	COs	Marks
Assignment/Quiz – 1	1	A1=5
Assignment/Quiz – 2	2	A2=5
I-Mid Examination	1,2	B1=20
Assignment/Quiz – 3	3	A3=5
Assignment/Quiz – 4	4	A4=5
Assignment/Quiz – 5	5	A5=5
II-Mid Examination	3,4,5	B2=20
Evaluation of Assignment/Quiz Marks: $A=(A1+A2+A3+A4+A5)/5$	1,2,3,4,5	A=5
Evaluation of Mid Marks: $B=75\% \text{ of Max}(B1,B2)+25\% \text{ of Min}(B1,B2)$	1,2,3,4,5	B=20
Cumulative Internal Examination : A+B	1,2,3,4,5	A+B=25
Semester End Examinations	1,2,3,4,5	C=75
Total Marks: A+B+C	1,2,3,4,5	100

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

Electronics & Instrumentation Engineering graduates are expected to attain the following program educational objectives (PEOs) within a period of 3-5 years after graduation. Our graduates will:

PEO1: Successfully utilize engineering and non-engineering principles for design and analysis as needed in their field

PEO2: Become a life-long learner through the successful completion of advanced degree(s), continuing education, or other professional development.

PEO3: Exhibit effective communication, teamwork, leadership skills and ethical behaviour as per the standard practice in the workplace

PROGRAM OUTCOMES

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs):

After completion of program, Graduates will be able to

PSO1-Acquire the ability to explore the design, installation & operation of the basic instrumentation system used in industrial environments and also calibrate the process instruments.

PSO2- Apply appropriate modern Engineering hardware and software tools like PLC, LABVIEW, MATLAB in order to implement and evaluate in process control and instrumentation system along with safety measures that enables him/her to work effectively as an individual and in a multidisciplinary team.

D.Venkata Lakshmi	Mrs.Rani Rudrama	Dr.Rambabu Busi	Dr.Poornaiah Billa
Course Instructor	Course Coordinator	Module Coordinator	HOD



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC with B++ Grade, ISO 9001:2015 Certified Institution

Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada

L.B.Reddy Nagar, Mylavaram-521230, Krishna Dist, Andhra Pradesh, India

ELECTRONICS & INSTRUMENTATION ENGINEERING

COURSE HANDOUT

Part-A

PROGRAM : B.Tech., VII-Sem., EIE

ACADEMIC YEAR : 2019-20

COURSE NAME & CODE : MPMC-S313

L-T-P STRUCTURE : 3-1-0

COURSE CREDITS : 3

COURSE INSTRUCTOR : Mrs.G.Anusha

COURSE COORDINATOR : Mr.B.V.N.R.SivaKumar

Pre-requisites: Digital Electronic Circuits, Computer Organization

1. Course Educational Objectives (CEOs):

This course provides the 8086 Microprocessor Architecture and Assembly Language Programming, Memory Interfacing with 8086 Microprocessor, Various interfacing peripherals with 8086 Microprocessor, Concepts of Interrupts and Serial Communication, 8051 Microcontroller Architecture and Assembly Language Programming

2. Course Outcomes (COs):

At the end of the course, the student will be able to:

CO1: Enumerate the architecture of 8086 Microprocessor, 8051 Microcontroller and different Modes of operation of 8086 Microprocessor

CO2: Illustrate the issues involved in interfacing of various Peripherals to 8086 Microprocessor.

CO3: Analyzing various interrupts and Data transfer schemes.

CO4: Develop Programs in 8086 Microprocessor, 8051 Microcontroller for real time applications

CO5: Construct the system using memory chips and peripheral chips for 16 bit 8086 Microprocessor.

COURSE ARTICULATION MATRIX (Correlation between COs& POs, PSOs):

Course Code	COs	Programme Outcomes												PSOs		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	
S313	1	3											2		3	
	2	3											2		3	
	3	3											2		2	
	4	2		2									1		2	
	5	2		1									1		1	
		1 = Slightly (low)			2 = Moderate (medium)						3-Substantially(High)					

BOS APPROVED TEXT BOOKS:

1. A.K.Ray and K.M. Bhurchandi ,Advanced Microprocessor And Peripherals (2/e), TMH Publishers.
2. Muhammad Ali Mazidi, Janice GillispieMazidi, RolinD.Mckinlay “Microcontrollers and Embedded System”, Pearson Education Publishers.

BOS APPROVED REFERENCE BOOKS:

1. Douglas V. Hall, “Micro Processors & Interfacing”, TMH, 2007.
2. Raj Kamal, Microcontrollers Architecture, Programming, Interfacing and System Design, Pearson Education Publishers.
3. J.K.Uffenbeck, “The 8088 and 8086 Micro Processors”, PHI, 4th Edition, 2003.
4. Ajay Deshmukh, “Micro Controllers-Theory and Applications” , Tata McGraw Hill Publishers.
5. Kenneth J.Ayala, “The 8051 Micro Controller”, Cenage Learning Publishers.

Part-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I :Micro Processor Architecture&Instruction set

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction to Microprocessors	1	17.06.19		1	CO1	T1	
2.	Purpose of a Microprocessor	1	18.06.19		1	CO1	T1	
3.	different types of Microprocessors	1	20.06.19		1	CO1	T1	
4.	Features of Microprocessors	1	22.06.19		1	CO1	T1	
5.	Comparison of Microprocessors	1	24.06.19		1,2	CO1	T1	
6.	Pin diagram of 8086	1	25.06.19		1,2	CO1	T	
7.	Architecture of 8086	1	27.06.19		3	CO1	T1	
8.	Pin diagram of 8086	1	29.06.19		1	CO1	T1	
9.	Special functions of General purpose registers,	1	01.07.19		1,2	CO1	T1	
10.	Tutorial -1	1	02.07.19		1	CO1	T3	
11.	Special purpose registers	1	04.07.19		1	CO1	T1	
12.	8086 flag register	1	06.07.19		1	CO1	T1	
13.	Tutorial -2	1	08.07.19		1	CO1	T3	
14.	Addressing modes of 8086.	1	09.07.19		1	CO1	T1	
15.	Instruction set of 8086	1	11.07.19		1	CO1	T1	

16.	Instruction set of 8086	1	13.07.19		1,2	CO1	T1
17.	Assembly language programs involving logical	1	15.07.19		3	CO1	T1
18.	Assembly language programs involving Branch Instructions	1	16.07.19		1	CO1	T1
19.	Assembly language programs involving Call Instructions	1	18.07.19		1	CO1	T1
20.	Tutorial -3	1	20.07.19		1	CO1	T3
21.	Assembly language programs- Sorting	1	22.07.19		1	CO1	T1
22.	Evaluation of Arithmetic Expressions	1	23.07.19		1	CO1	T1
23.	String manipulation	1	25.07.19		1	CO1	T1
24.	Assembler directives, Simple programs	1	27.07.19		1	CO1	T1
No. of classes required to complete UNIT-I		24					

UNIT-II :Memory and I/O Interfacing

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
25.	Introduction to Memory Interfacing	1	29.07.19		1	CO2	T1	
26.	Introduction to I/O Interfacing	1	30.07.19		1	CO2	T1	
27.	Minimum mode of operation	1	01.08.19		1	CO2	T1,R2	
28.	Tutorial -4	1	03.08.19		1	CO2	T3	

29.	Maximum mode of operation	1	05.08.19		3	CO2	T1	
30.	Timing Diagram	1	06.08.19		1	CO2	T1	
31.	Static RAM interfacing to 8086 Microprocessor	1	08.08.19		1	CO2	T1,R2	
32.	EPROM interfacing to 8086 Microprocessor	1	10.08.19			CO2	T1	
33.	I-MID Exams		13.08.19			CO2	-	
34.	I-MID Exams		14.08.19			CO2	-	
35.	I-MID Exams		16.08.19			CO2	-	
36.	I-MID Exams		17.08.19			CO2	-	
37.	I-MID Exams					CO2	-	
No. of classes required to complete UNIT-II		08			No. of classes taken:			

UNIT-III :Peripherals and intrfacing

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
38.	Introduction to Peripheral Interfacing	1	19.08.19		1	CO3	T1	
39.	Need for DMA.	1	20.08.19		1	CO3	T1	
40.	DMA data transfer Method	1	22.08.19		1	CO3	T1,R2	
41.	Interfacing with 8237/8257	1	26.08.19		1	CO3	T1	
42.	Tutorial -4	1	27.08.19		1,2	CO3	T2	

43.	8255 PPI	1	29.08.19		1	CO3	T1
44.	Various modes of operation of 8255	1	31.08.19		1	CO3	T1
45.	8255 PPI interfacing to 8086	1	03.09.19		1	CO3	T1
46.	Tutorial -5	1	05.09.19		1	CO3	T2,R3
47.	Keyboard interfacing	1	07.09.19		3	CO3	T1
48.	Seven segment Display interfacing	1	09.09.19		1	CO3	T1
49.	Stepper Motor interfacing	1	12.09.19		1	CO3	T1
50.	Tutorial -6	1	14.09.19		1	CO3	T2
51.	ADC 0808/0809	1	16.09.19		1	CO3	T1
52.	ADC interfacing	1	17.09.19		1,2	CO3	T1
53.	DAC interfacing	1	19.09.19				
No. of classes required to complete UNIT-III		17			No. of classes taken:		

UNIT-IV :Interrupts&Data Transfer

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
54.	INTRODUCTION OF Interrupt Interrupt Vector table	1	21.09.19		1	CO4	T1	
55.	Interrupt service routines	1	23.09.19		1	CO4	T1	
56.	Tutorial -7	1	24.09.19		3	CO4	T2,R4	
57.	Introduction to DOS and BIOS interrupts	1	26.09.19		1	CO4	T1	
58.	8259 PIC Architecture		28.09.19					
59.	Interfacing cascading of interrupt controller	1	30.09.19		1	CO4	T1	

60.	Tutorial -8	1	01.10.19		1	CO4	T	
61.	Serial data transfer schemes ,RS 232C, TTL to RS 232C	1	03.10.19		1	CO4	T1	
62.	8251 USART architecture, interfacing.	1	05.10.19			CO4	T1	
No. of classes required to complete UNIT-IV		11			No. of classes taken:			

UNIT-V:Microcontroller

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
63.	8051 Microcontroller Architecture	1	07.10.19		1	CO5	T1	
64.	Register set of 8051	1	10.10.19		1	CO5	T1	
65.	Instruction Set and Programs	1	12.10.19		1	CO5	T1	
66.	Modes of timer operation	1	14.10.19		3	CO5	T1,R1	
67.	Tutorial -9	1	15.10.19		1	CO5	T2	
68.	Interrupt structure of 8051	1	17.10.19		1	CO5	T1	
No. of classes required to complete UNIT-V		07	19.10.19					

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
69.	Embedded Introduction	1	19.10.19					

Teaching Learning Methods

TLM1	Chalk and Talk	TLM4	Demonstration (Lab/Field Visit)
TLM2	PPT	TLM5	ICT

			(NPTEL/SwayamPrabha/MOOCs)
TLM3	Tutorial	TLM6	Group Discussion/Project

Part - C

EVALUATION PROCESS:

Evaluation Task	COs	Marks
Assignment/Quiz – 1	1	A1=5
Assignment/Quiz – 2	2	A2=5
I-Mid Examination	1,2	B1=20
Assignment/Quiz – 3	3	A3=5
Assignment/Quiz – 4	4	A4=5
Assignment/Quiz – 5	5	A5=5
II-Mid Examination	3,4,5	B2=20
Evaluation of Assignment/Quiz Marks: $A=(A1+A2+A3+A4+A5)/5$	1,2,3,4,5	A=5
Evaluation of Mid Marks: $B=75\% \text{ of Max}(B1,B2)+25\% \text{ of Min}(B1,B2)$	1,2,3,4,5	B=20
Cumulative Internal Examination : A+B	1,2,3,4,5	A+B=25
Semester End Examinations	1,2,3,4,5	C=75
Total Marks: A+B+C	1,2,3,4,5	100

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

Electronics & Instrumentation Engineering graduates are expected to attain the following program educational objectives (PEOs) within a period of 3-5 years after graduation. Our graduates will :

PEO1: Successfully utilize engineering and non-engineering principles for design and analysis as needed in their field

PEO2: Become a life-long learner through the successful completion of advanced degree(s), continuing education, or other professional development.

PEO3: Exhibit effective communication, teamwork, leadership skills and ethical behaviour as per the standard practice in the workplace

PROGRAM OUTCOMES

Engineering Graduates will be able to:

- Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex

engineering problems.

2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the **engineering and management principles and apply these to one's own work, as a member and leader** in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs):

After completion of programme, Graduates will be able to

PSO1-Acquire the ability to explore the design, installation & operation of the basic instrumentation system used in industrial environments and also calibrate the process instruments..

PSO2- Apply appropriate modern Engineering hardware and software tools like PLC, LABVIEW, MATLAB in order to implement and evaluate in process control and instrumentation system along with safety measures that enables him/her to work effectively as an individual and in a multidisciplinary team.

Mrs.G.Anusha	Mr.B.V.N.R.SivaKumar	Prof.G.M.Rao	Prof.B.Pooraiiah
Course Instructor	Course Coordinator	Module Coordinator	HOD

	5	3		3			3						2	
1 = Slightly (low) 2 = Moderate (medium) 3-Substantially(High)														

BOS APPROVED TEXT BOOKS:

T1:Black & Veatch , Power Plant Engineering, Publisher: Chapman & Hall Inc- New York, CBS

BOS APPROVED REFERENCE BOOKS:

1. Pergamon Press, Modern Power Station Practice, Vol. 6, Instrumentation, Controls and Testing –, Oxford,1971.
2. Sam G Dukelow “The Control of Boilers” – 2nd Edition, ISA Publication, 1991.
3. Elokna S.M. and Kohal A., “Stand Boiler Operations” – Questions and Answers TMH, New Delhi, 1994.Part-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I:OVERVIEW OF POWER GENERATION

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction to power plant- Objectives of power plants, Importance of power plants with examples	1	18/06/2019		1,2	CO1	T1	
2.	Types of power Generation- Hydro, thermal,Nuclear, Solar	1	19/06/2019		1,2	CO1	T1	
3.	Hydr74o power plants – Building blocks, Thermal power plants – Building blocks	1	20/06/2019		1,2	CO1	T1	
4.	TUTORIAL	1	21/06/2019		3	CO1	T1	
5.	Nuclear power generation, types of Nuclear reactors Solar power, Wind	1	02/07/2019		1,2	CO1	T1	

	power							
6.	Geo Thermal Energy ,Tidal power, Comparisons of various power plants	1	03/07/2019		1,2	CO1	T1	
7.	Importance of instrumentation for power generation, Various Mechanical Transducers	1	04/07/2019		1,2	CO1	T1	
8.	TUTORIAL	1	05/07/2019		3	CO1	T1	
9.	Various Electrical Transducers	1	09/07/2019		1,2	CO1	T1	
10.	Basic Building Blocks of Thermal power plants	1	10/07/2019		1,2	CO1	T1	
11.	Assignment/Quiz	1	11/07/2019		3	CO1		
12.	TUTORIAL	1	12/07/2019		3	CO1	T1	
No. of classes required to complete UNIT-I		12			No. of classes taken:			

UNIT-II:STEAM GENERATOR

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
13.	Steam Generator systems, excess air	1	16/07/2019		1,2	CO2	T1	
14.	steam temperature control, minimum load capability	1	17/07/2019		1,2	CO2	T1	
15.	flue gas emissions, feed water quality,Steam purity	1	18/07/2019		1,2	CO2	T1,R2	
16.	TUTORIAL	1	19/07/2019		3	CO2	T1	

17.	steam generator arrangement,	1	23/07/2019		1,2	CO2	T1	
18.	Startup system Types of Boilers	1	24/07/2019		1,2	CO2	T1	
19.	Furnace-drum boiler, super heater-	1	25/07/2019		1,2	CO2	T1	
20.	TUTORIAL	1	26/07/2019		3	CO2	T1	
21.	Reheater- Economizer, air heater	1	30/07/2019		1,2	CO2	T1	
22.	Soot blowers, coal feeder	1	31/07/2019		1,2	CO2	T1	
23.	pulverizes burner ignites warm-up burner	1	01/08/2019		1,2	CO2	T1	
24.	TUTORIAL	1	02/08/2019		3	CO2	T1	
25.	Ash Hoppers Damper	1	06/08/2019		1,2	CO2	T1	
26.	Assignment/ Quiz	1	07/08/2019		3	CO2	T1	
No. of classes required to complete UNIT-II		14			No. of classes taken:			

UNIT-III: STEAM TURBINES & WATER CIRCULATION SYSTEM

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
27.	Operating principles, steam expansion	1	20/08/2019		1,2	CO3	T1	
28.	electrical energy, turbine types	1	21/08/2019		1,2	CO3	T1	
29.	steam turbine, components of steam generator	1	22/08/2019		1,2	CO3	T1	
30.	TUTORIAL	1	23/08/2019		3	CO3	T1	
31.	steam flow control, Circulation of water system,	1	27/08/2019		1,2	CO3	T1	
32.	cooling pond, Recirculation	1	28/08/2019		1,2	CO3	T1	

	cooling system							
33.	components of circulation water system	1	29/08/2019		1,2	CO3	T1	
34.	TUTORIAL	1	30/08/2019		3	CO3	T1	
35.	Assignment/ Quiz	1	03/09/2019		3	CO3	T1	
No. of classes required to complete UNIT-III		09			No. of classes taken:			

UNIT-IV: PLANT CONTROL & EMISSION CONTROL

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
36.	Plant Control System :On-Off control, Feed forward Control	1	04/09/2019		1,2	CO4	T1	
37.	Cascade Control, Modulating control: Boiler control	1	05/09/2019		1,2	CO4	T1	
38.	TUTORIAL	1	06/09/2019		3	CO4	T1	
39.	load demand control, firing rate control	1	11/09/2019		1,2	CO4	T1	
40.	pulverizer coal and air flow control, Furnace draft control	1	12/09/2019		1,2	CO4	T1	
41.	Feed water flow control, superheat & Reheat steam	1	13/09/2019		1,2	CO4	T1	
42.	temperature control – Boiler Feedpump Recirculation control	1	17/09/2019		1,2	CO4	T1	

43.	TUTORIAL	1	18/09/2019		3	CO4	T1	
44.	Emission control: Particulate control, Nitrogen Oxide emission control	1	19/09/2019		1,2	CO4	T1	
45.	sulfur dioxide, emission control, NOx and SO ₂ Removal	1	20/09/2019		1,2	CO4	T1	
46.	Assignment/ Quiz	1	24/09/2019		3	CO4	T1	
No. of classes required to complete UNIT-IV		11			No. of classes taken:			

UNIT-V : EMERGING TECHNOLOGIES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
47.	Fossil Fuel Technology Manufacturing Tests, GCC-Indirect fired Combined Cycle	1	25/09/2019		1,2	CO5	T1	
48.	MHD, Fuel cell, Renewable Techniques: solar – wind	1	26/09/2019		1,2	CO5	T1	
49.	bio mass – ocean – geothermal	1	27/09/2019		1,2	CO5	T1	
50.	TUTORIAL	1	01/10/2019		3	CO5	T1	
51.	Fusion Techniques, Magnetic confinement concept	1	03/10/2019		1,2	CO5	T1	
52.	Inertial confinement Techniques.	1	04/10/2019		1,2	CO5	T1	
53.	TUTORIAL	1	08/10/2019		3	CO5	T1	
54.	Assignment/	1	11/10/2019		3	CO5	T1	

	Quiz								
No. of classes required to complete UNIT-V		08			No. of classes taken:				

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
68.								
69.								
70.								

Teaching Learning Methods			
TLM1	Chalk and Talk	TLM4	Demonstration (Lab/Field Visit)
TLM2	PPT	TLM5	ICT (NPTEL/Swayam Prabha/MOOCs)
TLM3	Tutorial	TLM6	Group Discussion/Project

Part - C

EVALUATION PROCESS:

Evaluation Task	COs	Marks
Assignment/Quiz – 1	1	A1=5
Assignment/Quiz – 2	2	A2=5
I-Mid Examination	1,2	B1=20
Assignment/Quiz – 3	3	A3=5
Assignment/Quiz – 4	4	A4=5
Assignment/Quiz – 5	5	A5=5
II-Mid Examination	3,4,5	B2=20
Evaluation of Assignment/Quiz Marks: $A=(A1+A2+A3+A4+A5)/5$	1,2,3,4,5	A=5
Evaluation of Mid Marks: $B=75\%$ of Max(B1,B2)+25% of Min(B1,B2)	1,2,3,4,5	B=20
Cumulative Internal Examination : A+B	1,2,3,4,5	A+B=25
Semester End Examinations	1,2,3,4,5	C=75
Total Marks: A+B+C	1,2,3,4,5	100

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7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
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PROGRAM SPECIFIC OUTCOMES (PSOs):

After completion of programme, Graduates will be able to

PSO1-Acquire the ability to explore the design, installation & operation of the basic instrumentation system used in industrial environments and also calibrate the process instruments..

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Mr.B.SANDEEP	Mr. R.A.NAIK	Mr.R.A.NAIK	Dr.B.POORNAIAH
Course Instructor	Course Coordinator	Module Coordinator	HOD

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

(Autonomous & Affiliated to JNTUK, Kakinada & Approved by AICTE, New Delhi,
NAAC Accredited with 'B++' grade, Accredited by NBA, Certified by ISO 9001:2015)
L B Reddy Nagar, Mylavaram-521 230, Krishna District, Andhra Pradesh.

COURSE HANDOUT

Part-A

PROGRAM : B.Tech., VII-Sem., EIE
ACADEMIC YEAR : 2019-20
COURSE NAME & CODE : Bio Medical Instrumentation - S 148
L-T-P STRUCTURE : 3-1-0
COURSE CREDITS : 3
COURSE INSTRUCTOR : G.Mahammed Rafi
COURSE COORDINATOR : Dr.T.Satyanarayana

PRE-REQUISITES: Transducers in Instrumentation, Integrated circuits and applications.

COURSE EDUCATIONAL OBJECTIVES (CEOs) : This course provides the knowledge on Medical instrumentation system , different types of electrodes used in bio-potential recording, Cardiovascular , nervous systems and respiratory system.

COURSE OUTCOMES (COs)

After completion of the course, the student will be able to

- CO1: Acquire knowledge on basic medical instrumentation system and classification of electrodes used in bio-potential recording.
CO2: Identify suitable approach and measure bio electric potentials corresponding to cardiovascular and nervous Systems.
CO3: Discuss measuring techniques of blood pressure, blood flow including construction and working details of Therapeutic and Prosthetic devices.
CO4: Illustrate Clinical laboratory instruments, Medical imaging systems including Physiological effects of electric current, shock hazards.
CO5: Summarize Physiology and instrumentation concerned with respiratory system.

COURSE ARTICULATION MATRIX (Correlation between COs&POs,PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2												2	
CO2		2											1	
CO3		2											2	
CO4											1		2	
CO5											1		1	

Note: Enter Correlation Levels **1** or **2** or **3**. If there is no correlation, put '-'

1- Slight (Low), **2** – Moderate (Medium), **3** - Substantial (High).

BOS APPROVED TEXT BOOKS:

- T1** Leslie Cromwell, Fred j. Weibell, Erich a. Pfeiffer, "Bio medical instrumentation & Measurements", PHI publishers, 2nd edition, 2001.
T2 John G. Webster, editor John Wiley, "Medical instrumentation application & design", 3rd edition, 2009.

BOS APPROVED REFERENCE BOOKS:

R1 Dr.M.Arumugam "Bio medical instrumentation" Anuradha Agencies publishers,2003

R2 R.S.Khandpur,"HandBook of BioMedical Instrumentation",TMH, NewDelhi, D

Part-B**COURSE DELIVERY PLAN (LESSON PLAN)****UNIT-I :**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction to Subject	1	18-06-2019		1	CO1	T1	
2.	Course Outcomes	1	19-06-2019		1	CO1	T1	
3.	Introduction to UNIT-I	1	20-06-2019		1	CO1	T1	
4.	Generalized Medical instrumentation system	1	22-06-2019		1	CO1	T1	
5.	Problems encountered with measurements	1	25-06-2019		1	CO1	T1	
6.	Problems encountered from Human beings	1	26-06-2019		1	CO1	T1	
7.	Cell structure	1	27-06-2019		1	CO1	T1	
8.	Action potentials	1	29-06-2019		1	CO1	R1	
9.	Resting potentials	1	02-07-2019		1	CO1	R1	
10.	TUTORIAL-1	1	03-07-2019		3	CO1	T1	
11.	Polarized and repolarized cells	1	04-07-2019		1	CO1	T1	
12.	Bio-potential,Bio-chemical electrodes	1	06-07-2019		1	CO1	T1	
13.	Micro Electrodes	1	09-07-2019		1	CO1	T1	
14.	TUTORIAL-2	1	10-07-2019		3	CO1	T1	
15.	Skin Surface Electrodes	1	11-07-2019		1	CO1	T1	
16.	Internal Electrodes	1	13-07-2019		1	CO1	T1	
17.	External electrodes	1	16-07-2019		1	CO1	T1	
No. of classes required to complete UNIT-I		17			No. of classes taken:			

UNIT-II : PHYSIOLOGY OF CARDVASCULAR,NERVOUS SYSTEMS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
18.	Introduction to ECG	1	17-07-2019		1	CO2	T1	

19.	Origin of ECG	1	18-07-2019		2	CO2	T1
20.	Block Diagram of ECG Machine,	1	20-07-2019		1	CO2	T1
21.	Einthoven triangle	1	23-07-2019		1	CO2	T1
22.	12 Lead Configuration	1	24-07-2019		1	CO2	T1
23.	Introduction to EEG	1	25-07-2019		1	CO2	T1
24.	Block Diagram of EEG recording System	1	27-07-2019		1	CO2	T1
25.	Electrode locations,	1	30-07-2019		1	CO2	T1
26.	TUTORIAL-3	1	31-07-2019		3	CO2	T1
27.	10-20 electrode System	1	01-08-2019		1	CO2	T1
28.	Resting Rhythms	1	03-08-2019		1	CO2	T1
29.	.Resting Rhythms Types	1	06-08-2019		1	CO2	T1
30.	Introduction to EMG	1	07-08-2019		1	CO2	T1
31.	Block Diagram of EMG machine, Stimulation	1	08-08-2019		1	CO2	T1
No. of classes required to complete UNIT-II		14			No. of classes taken:		

UNIT-III :

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
32.	Introduction to BP	1	10-08-2019		1	CO3	T1	
33.	Direct measuring techniques of BP	1	20-08-2019		1	CO3	T1	
34.	TUTORIAL-4	1	21-08-2019		3	CO3	T1	
35.	Indirect measuring techniques of BP	1	22-08-2019		1	CO3	T1	
36.	Introduction to Blood Flow	1	27-08-2019		1	CO3	T1	
37.	Electro Magnetic method	1	28-08-2019		1	CO3	T1	
38.	Doppler ,Dilution methods	1	29-08-2019		1	CO3	T1	
39.	Introduction to Therapeutic and Prosthetic Devices	1	31-08-2019		1	CO3	T1	
40.	Pacemaker	1	03-09-2019		1	CO3	R2	
41.	TUTORIAL-5	1	04-09-2019		3	CO3	R2	
42.	Pacemaker-working operation	1	05-09-2019		1	CO3	R2	
43.	Defibrillator	1	07-09-2019		1	CO3	R2	

No. of classes required to complete UNIT-III	12	No. of classes taken:
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UNIT-IV :

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
44.	Introduction to Clinical laboratory Instruments	1	11-09-2019		1			
45.	Spectrophotometry-principle, working	1	12-09-2019		1	CO4	T2	
46.	Flame photometer-principle, working	1	14-09-2019		1	CO4	T2	
47.	TUTORIAL-6	1	17-09-2019		3	CO4	T2	
48.	Introduction to Medical Imaging Instruments	1	18-09-2019		1	CO4	T2	
49.	Ultrasonography	1	19-09-2019		1	CO4	T2	
50.	Computed Tomography-principle	1	21-09-2019		1	CO4	T2	
51.	TUTORIAL-7	1	24-09-2019		3	CO4	R2	
52.	Ultrasonic Transducers	1	25-09-2019		1	CO4	R2	
53.	Introduction to Patient Safety	1	26-09-2019		1	CO4	R2	
54.	Physiological effects of Electrical Current	1	28-09-2019		1	CO4	R2	
55.	Electric shock Hazards, Electrical safety analyzer.	1	01-10-2019		1	CO4	T2	
No. of classes required to complete UNIT-IV		12	No. of classes taken:					

UNIT-V : RESPIRATORY SYSTEM:

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
56.	Introduction to RESPIRATORY SYSTEM:	1	03-10-2019		1	CO5	T1	
57.	Physiology of the Respiratory System,	1	05-10-2019		2	CO5	T1	
58.	Lung Volumes,	1	09-10-2019		1	CO5	T1	
59.	Mechanics of Breathing,	1	11-10-2019		1	CO5	T1	
60.	Spirometry	1	12-10-2019		1	CO5	T1	

61.	TUTORIAL-8	1	14-10-2019		3	CO5	T1	
62.	. Respiratory Therapy Equipment-Ventilators,	1	17-10-2019		1	CO5	T1	
63.	Pnuemotachograph	1	18-10-2019					
No. of classes required to complete UNIT-V		8			No. of classes taken:			

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign
64.	Haemodialysis Machine	1	19-10-2019		1	CO3	R2	

Teaching Learning Methods			
TLM1	Chalk and Talk	TLM4	Demonstration (Lab/Field Visit)
TLM2	PPT	TLM5	ICT (NPTEL/Swayam Prabha/MOOCs)
TLM3	Tutorial	TLM6	Group Discussion/Project

Part - C

EVALUATION PROCESS:

Evaluation Task	COs	Marks
Assignment/Quiz – 1	1	A1=5
Assignment/Quiz – 2	2	A2=5
I-Mid Examination	1,2	B1=20
Assignment/Quiz – 3	3	A3=5
Assignment/Quiz – 4	4	A4=5
Assignment/Quiz – 5	5	A5=5
II-Mid Examination	3,4,5	B2=20
Evaluation of Assignment/Quiz Marks: $A=(A1+A2+A3+A4+A5)/5$	1,2,3,4,5	A=5
Evaluation of Mid Marks: $B=75\% \text{ of Max}(B1,B2)+25\% \text{ of Min}(B1,B2)$	1,2,3,4,5	B=20
Cumulative Internal Examination : A+B	1,2,3,4,5	A+B=25
Semester End Examinations	1,2,3,4,5	C=75
Total Marks: A+B+C	1,2,3,4,5	100

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

Electronics & Instrumentation Engineering graduates are expected to attain the following program educational objectives (PEOs) within a period of 3-5 years after graduation.

Our graduates will be

PEO1: Successfully utilize engineering and non-engineering principles for design and analysis as needed by the field

PEO2: life-long learner through the successful completion of advanced degree(s), continuing education, or other professional development.

PEO3: Exhibit effective communication, teamwork, leadership skills and ethical behaviour as standard practice in the workplace

PROGRAMME OUTCOMES (POs)

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and

design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes

PSO1- Acquire the ability to explore the design, installation & operation of the basic instrumentation system used in industrial environments and also calibrate the process instruments..

PSO2- Apply appropriate modern Engineering hardware and software tools like PLC, LABVIEW, MATLAB in order to implement and evaluate in process control and instrumentation system along with safety measures that enables him/her to work effectively as an individual and in a multidisciplinary team.

G.Mahammed Rafi	Dr.T.Satyanarayana		Dr.B.Poornaiah
Course Instructor	Course Coordinator	Module Coordinator	HOD



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC with B++ Grade, ISO 9001:2015 Certified Institution

Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada

L.B.Reddy Nagar, Mylavaram-521230, Krishna Dist, Andhra Pradesh, India

ELECTRONICS & INSTRUMENTATION ENGINEERING

LESSON PLAN

ACADEMIC YEAR : 2019-20

COURSE : B.Tech(VIISem)

BRANCH : Electronics & Instrumentation Engineering

SUBJECT : MPMC Lab

FACULTY: Mrs. G.Anusha ,Mr.Ch.Seshu Kumar, Mrs K.Pavani

CODE: L161

17.06.19	Monday	I-Batch	Introduction to MPMC programs
19.06.19	Wednesday	II-Batch	
24.06.19	Monday	I-Batch	Data Transfer Operations
26.06.19	Wednesday	II-Batch	
01.07.19	Monday	I-Batch	Data Transfer Operations
03.07.19	Wednesday	II-Batch	
08.07.19	Monday	I-Batch	Arithmetical Operations
10.07.19	Wednesday	II-Batch	
15.07.19	Monday	I-Batch	Arithmetical Operations
17.07.19	Wednesday	II-Batch	
22.07.19	Monday	I-Batch	Logical Operations
24.07.19	Wednesday	II-Batch	
29.07.19	Monday	I-Batch	String Operations
31.07.19	Wednesday	II-Batch	
05.08.19	Monday	I-Batch	Code Conversion Programs
07.08.19	Wednesday	II-Batch	
19.08.19	Monday	I-Batch	Sorting (Ascending & Descending Order)
14.08.19	Wednesday	II-Batch	
26.08.19	Monday	I-Batch	Read a Character and Display using MASM
21.08.19	Wednesday	II-Batch	
09.09.19	Monday	I-Batch	String Comparison (PASSWORD CHECKING)
28.08.19	Wednesday	II-Batch	
16.09.19	Monday	I-Batch	Stepper motor Interfacing
04.09.19	Wednesday	II-Batch	
23.09.19	Monday	I-Batch	DAC Interfacing (Sine, Square, Saw tooth, Triangular)
11.09.19	Wednesday	II-Batch	
30.09.19	Monday	I-Batch	DAC Interfacing (Sine, Square,

18.09.19	Wednesday	II-Batch	Saw tooth, Triangular)
07.10.19	Monday	I-Batch	Arithmetical Operations
25.09.19	Wednesday	II-Batch	
14.10.19	Monday	I-Batch	Logical Operations, Bit manipulation operations
09.10.19	Wednesday	II-Batch	
16.10.19	Wednesday	II-Batch	Revision

Signature of the faculty

Signature of the HOD



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ELECTRONICS & INSTRUMENTATION ENGINEERING

LESSON PLAN

ACADEMIC YEAR : 2019-20

COURSE : B.Tech(VIISem)

BRANCH : EIE

SUBJECT : PLC & BMI Lab

FACULTY: Mr.R.Sarveswara Prasad

Mr.R.Anjaneyulu Naik,B.Sandeep

CODE: L168

17.06.19	Monday	I-Batch	Introduction to PLC
19.06.19	Wednesday	II-Batch	
24.06.19	Monday	I-Batch	Study of Logic gates using PLC (Programmable Logic Control)
26.06.19	Wednesday	II-Batch	
01.07.19	Monday	I-Batch	DC Motor control system using PLC
03.07.19	Wednesday	II-Batch	
08.07.19	Monday	I-Batch	Pressure control system using PLC
10.07.19	Wednesday	II-Batch	
15.07.19	Monday	I-Batch	Traffic light control using PLC
17.09.19	Wednesday	II-Batch	
22.06.19	Monday	I-Batch	Study of Bottle filling automation system using PLC
24.07.19	Wednesday	II-Batch	
29.07.19	Monday	I-Batch	Repetition
31.07.19	Wednesday	II-Batch	
05.08.19	Monday	I-Batch	Introduction to Biomedical
07.08.19	Wednesday	II-Batch	
14.08.19	Wednesday	II-Batch	Measurement & observation of systolic & diastolic pressure values of human heart
19.08.19	Monday	I-Batch	
21.08.19	Wednesday	II-Batch	EEG (Electro-Encephalograph) simulator
26.08.19	Monday	I-Batch	
28.08.19	Wednesday	II-Batch	EMG (Electro-Myograph) simulator
04.09.19	Monday	I-Batch	
09.09.19	Wednesday	II-Batch	ECG (Electro-Cardiograph) simulator
11.09.19	Monday	I-Batch	
16.09.19	Wednesday	II-Batch	Pacemaker Simulator
18.09.19	Monday	I-Batch	
23.09.19	Wednesday	II-Batch	Repetition
25.09.19	Monday	I-Batch	
30.09.19	Monday	I-Batch	Repetition
07.10.19	Monday	I-Batch	Internal
09.10.19	Wednesday	II-Batch	

Signature of the faculty

Signature of the HOD

